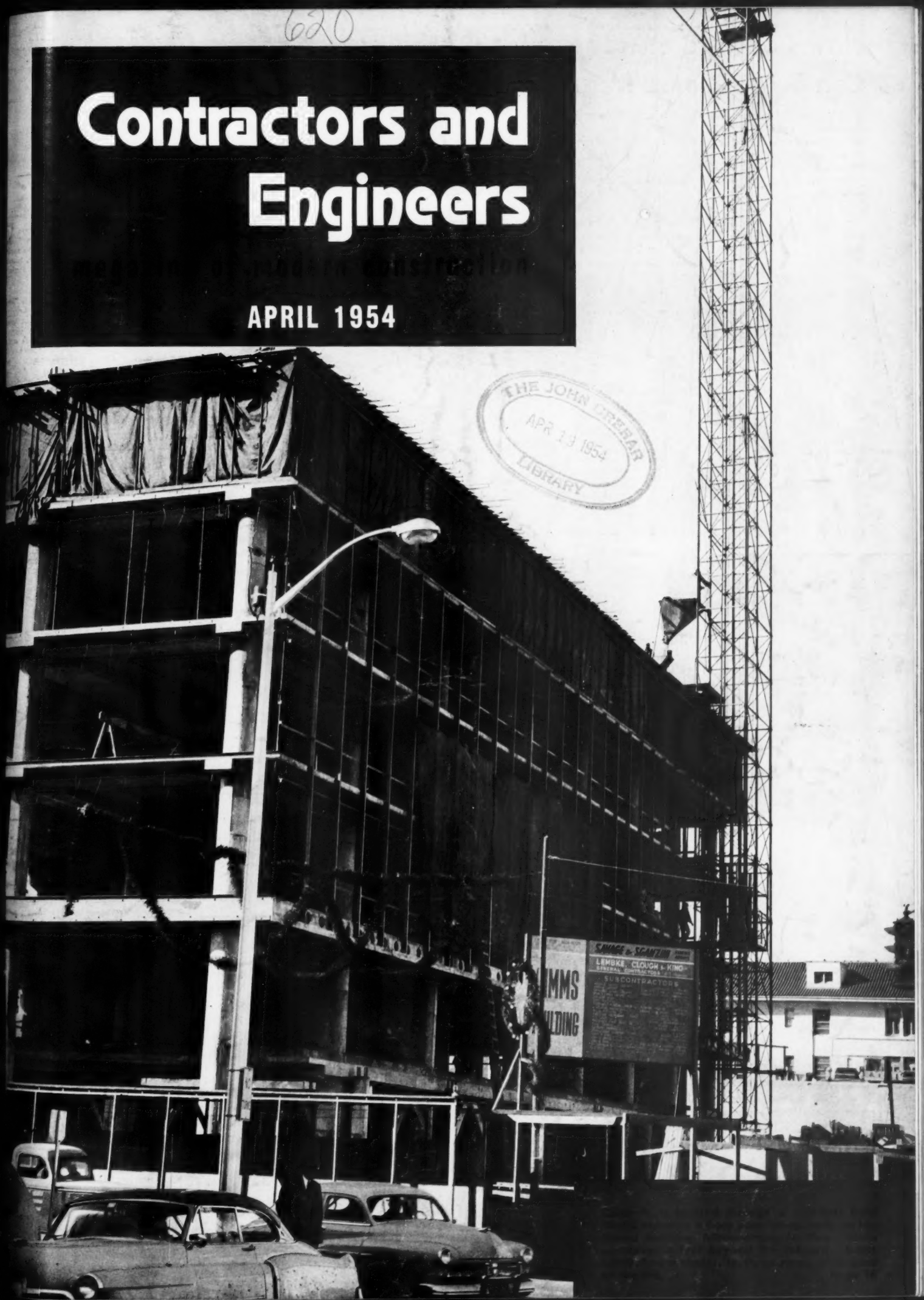
Contractors and Engineers

APRIL 1954



How Concrete of Required Workability Can Be Obtained Most Economically

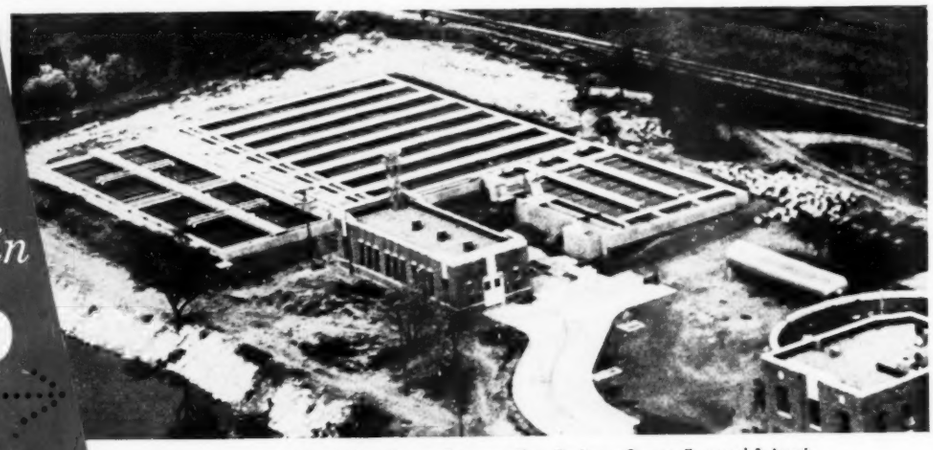
As every concrete man knows, obtaining increased workability by adding water has two serious disadvantages. First, it increases the cost of the concrete because more cement is required to maintain strength. Second, it lowers the quality of the concrete because it increases shrinkage and permeability and decreases durability.

Experience on thousands of jobs has proved that the best and most economical way to obtain required workability is with Pozzolith. When Pozzolith is added to a plain mix, slump is increased 150% or more.

For equal slump, approximately one gallon (15%) less water per sack of cement is required for a Pozzolith mix. Materials cost is lower . . . plasticity is improved . . . less time is required for placing and finishing.

In addition to producing required workability most economically, Pozzolith reduces shrinkage, lowers permeability and increases durability, because it lowers *unit water content* (water required per cubic yard of concrete.)

sound decision in* **1940**



Marion, Indiana Sewage Treatment Plant. Engineer—Consoer, Townsend & Associates, Chicago, Illinois; Contractor—Steigerwald & Borchert, Milwaukee, Wisconsin.

resulted in sound concrete **1954**

*design with lowest unit water content ...for maximum quality

For a given set of materials, air content and water-cement ratio, the *unit water content* (amount of water per cubic yard of concrete) is one of the most important basic factors affecting the quality of concrete. Leading authorities agree on this†.

Among the tools employed by engineers in line with this fact is Pozzolith—a proved means of lowering unit water content to insure minimum shrinkage, longer life.

How water content is reduced by Pozzolith for a given placeability is demonstrated quickly at your job—or even at your desk—while you watch. Or if you stipulate a low water content, the effectiveness of Pozzolith in aiding placeability—otherwise unobtainable—is immediate.

May we demonstrate these facts to you?

POZZOLITH...

the cement-dispersing, water-reducing agent, developed by The Master Builders Co. in 1932, which makes available the optimum amount of air in concrete and fully complies with the water-cement ratio law. Added at the mixer.

†See Bureau of Reclamation Concrete Manual, 5th Edition, Page 130.

"IRON-CLAD" CONCRETE FOR HEAVY TRAFFIC AREAS

The Masterplate "iron-clad" concrete floor is 4-6 times more wear-resistant than the best plain concrete floor, also corrosion-resistant, spark-safe, easy-to-clean, non-slip, non-dusting and economical. Non-colored and colored.

Experience in all types of plants has proved the value of Masterplate "iron-clad" concrete floors in helping to maintain a smooth flow of production, reduce maintenance expense and improve plant safety.

Only with Masterplate can a Masterplate "iron-armored" concrete floor with all its important service advantages be obtained. This is because only Masterplate contains the cement-dispersing agent calcium lignosulfonate which makes it possible to easily float a pound or more of the tough, ductile metal on fresh concrete and *keep it at the surface.*

Full information on Masterplate—for new floors and resurfacing old concrete floors—and "see-for-yourself" demonstration kit supplied on request by the manufacturer, The Master Builders Co., Cleveland 3, Ohio.

COLORED CONCRETE FLOORS FOR LIGHT TRAFFIC AREAS

Colorcron is being widely used by contractors to obtain uniformly colored, long wearing concrete floors for show rooms, churches, schools, apartments and offices; also for recreation rooms, patios, driveways, sidewalks, breezeways and garages. Floors can be scored to any desired pattern.

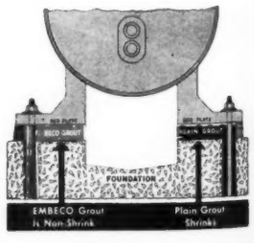
Color Plus Long Wear

Colorcron floors cost less additional than painting the floor, outwear the best plain concrete floor, and have more uniform and more intense color than is obtained from the use of pigments put in the mix. Colors: light grey, dark grey, red, brown, black, green, dark green, also non-colored.

Full directions for the use of Colorcron may be obtained from the manufacturer, The Master Builders Co., Cleveland 3, Ohio.

FOR NON-SHRINK GROUTING

To avoid shrinkage—principal cause of failure in equipment grouts—plant engineers use Embeco metallic aggregate, the material that produces a non-shrink flowable grout.



Cross-section shows how an easily placeable, flowable Embeco Grout counteracts shrinkage to produce full contact with bedplate.

Following are a few of the many other uses of Embeco non-shrink mortar: grouting anchor bolts; grouting steel floor grids; grouting around pipes through walls; caulking bell and spigot pipe; patching floors, ramps and platforms.

A 16-page booklet of useful data and information on the Embeco Non-Shrink Method of Grouting may be obtained from the manufacturer, The Master Builders Co., Cleveland 3, Ohio.

the MASTER BUILDERS Co.

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Contractors and Engineers
magazine of modern construction

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Acceptance under Section 34.64 P. L. & R. Authorized. Vol. 51 No. 4 $4 a Year, 50 cents a Copy

Issued Monthly by
BUTTENHEIM-DIX PUBLISHING CORPORATION
470 Fourth Ave., New York 16, N. Y.

CHICAGO 6, Ill., 1719 Daily News Bldg.
George S. Conover, Warner H. Robinson, Arthur B. Burgan

CLEVELAND 14, Ohio, 420 Leader Bldg.
Robert C. Burton

LOS ANGELES 27, Calif., 2238 Ben Lomond Drive
Albert T. Miller

EDITORIAL

Labor Is Learning on All Fronts

From the recent mid-winter meeting of the Building Trades Department, American Federation of Labor, there came a somewhat unusual but nonetheless gratifying report. Construction unions have decided to work with contractors for the purpose of eliminating job practices that have inflated building costs.

Apparently the success that several large builders have had on projects which did not use union labor has given both union officials and the rank and file food for thought. And this use of nonunion labor has not been confined to areas where unions are comparatively weak. The new and realistic attitude of the A. F. L. calls for close cooperation with the various contractors' or building employers' associations to reduce costs. If carried out, it should encourage a sustained construction program.

The matter of jurisdictional disputes within the union, with their threat to continued employment, was also taken under consideration at this meeting. As a solution, a plan was outlined whereby a five-member arbitration body would decide which A. F. L. union should perform any work under dispute. From this ruling no appeal could be taken. These internecine quarrels in the past have resulted in great financial losses to the owners, to labor, and to the general public. Last summer, for instance, during the peak of the construction season, a wildcat strike of truck drivers in metropolitan New York City forced 100,000 workers into idleness. If this new arbitration board within the union can put an end to all such irresponsible acts by its members, it will be of great value to everyone.

In other respects as well, labor is learning. A good if small-scale example of labor teaming up with management was noted recently on Long Island, N. Y., when the Caterpillar Tractor Co. and one of its dealers, the H. O. Penn Machinery Co., through the cooperation of the local unions, organized a school for equipment operators, mechanics, and maintenance men. More than 450 attended the three-week sessions (one class is shown at left) to learn the correct techniques in operating construction machinery. Details about the school are on page 116 in this issue.

Almost everyone in this country today is willing to extend a helping hand to the young person who is trying to learn. There are also many aids around, even in the construction industry, such as the above-mentioned operators' school, manufacturers' manuals, trade magazines, and books. Of the latter, we have reviewed on page 20 of this issue a new book, "How to Operate Excavation Equipment", by Herbert L. Nichols, Jr. It has the subtitle "for boys from 10 to 70 and for men who need to know". The beginner as well as the seasoned veteran in the construction industry can learn something from this book that will be of help to him in his work.

News and Views

Construction activity, falling at the end of '53 and the start of '54, may be on the upturn again. The climb first became apparent about a month ago. Dollar volume in 37 eastern states was $1,221,260,000 for February, according to F. W. Dodge Corp., marketing specialists. This amount, **higher than that for any other February,** reversed the usual tendency for January to show a higher figure.

In the west, where the greatest declines in dollar volume have been registered to date, the construction of an automobile toll tunnel through the Continental Divide in Colorado should soon help to **hold the line on awards.** The tunnel will provide a year-round link between the east and west slope areas that would be free from snow and rock slides. Estimated cost is more than $15,000,000.

Those preparing for the worst can take some consolation in the administration's plan to **bolster the nation's economy** should it falter badly. Recently announced proposals to supplement federal projects would have states and municipalities, backed by a federal guarantee, embark on a program of building hospitals, schools, and roads on short notice.

Road work is hardly in need of such assistance now. Awards are increasing, while road costs seem to be tapering off. Last spring, **costs fell for the first time in several years** to register 158.5 on the cost index. A rise, followed by another drop, gave 1953 a 160.2 index. This meant a saving of about $170 million in road construction last year. If the downward move persists, this year's work will be helped considerably.

Along with highway work, industrial construction is set for a peak year. Future prospects are even brighter now that the **first atomic power plant** is ready to be built in Pittsburgh. The plant, opening a new construction field, will be operated by Duquesne Light Co., and the Atomic Energy Commission will bear the brunt of the reactor's cost. The facility will take two years to complete and is expected to yield data which will help cut costs in similar plants.

Crane booms tilting skyward mark the site of the construction machinery exhibit at the Utrecht International Trade Fair at Utrecht, Holland. More U. S. industry representatives than ever are expected at this year's fair which ends April 8.

A planing device and Caterpillar motor-grader-mounted burner, furnished by Pavement Planing Co., Inc., Los Angeles, Calif., planes the old bituminous runway.

U. S. Air Force Photo

Runway Is Enlarged for Heavy Bombers

Heavy wheel loads and jet-plane use require a top-density subbase plus texture control of asphaltic concrete pavement for airstrip

A FEW MILES from El Paso, Texas, at Biggs Air Force Base, what was a multi-runway medium-bomber field has been converted into a single-runway heavy-bomber airstrip for the Strategic Air Command. Because of the necessity for accommodating the ponderous wheel loads of America's super-giants of the air, the Corps of Engineers ran into many interesting and complex design considerations.

Among other problems, it was necessary to design flexible base courses at 100 per cent modified AASHO density and to control the surface texture of the asphalt so that the penetration of jet fuel and gasoline, which has a diluting effect on the asphalt, could be kept to a minimum.

Robert E. McKee, Inc., El Paso, was the general contractor for the airstrip job. The firm did its own grading and subcontracted the rest of the work to the Northwestern Engineering Co., Denver, Colo. The job included such items as 335,000 cubic yards of grading, 610,000 square yards of subgrade and base course preparation and paving, and 210,000 tons of plant-mix asphalt.

Pavement Design

The pavement for the $2,128,263 project is designed for a gear-assembly load of 100,000 pounds supported by dual wheels on 37½-inch centers. There are also some strips designed for single-wheel loads of 25,000 pounds. In hard-stand locations, where the largest ships are parked, the heaviest possible design within economic limits has been developed.

The project involved improvements on existing pavements, an extension to the northeast-southwest runway, and widening and overlay work on existing portions of this runway. Biggs now has a main runway that is 12,000 feet long and 200 feet wide, as compared to the 9,500-foot length and 150-foot width of the original northeast-southwest strip. It consists of from 4 to 6 inches of asphaltic concrete on a base course of 6 inches of soil cement. Where the overlay pavement would have been less than 1½ inches because of tapering, the existing surface was heated and removed for a width of 24 to 30 feet by planing machines, so that a minimum of 4 inches of new

(Continued on next page)

Steel-bristle drag brooms, attached to a Barber-Greene finisher, brush the asphalt surface before the first pass is made with a roller to eliminate small open checks and minor voids.

U. S. Air Force Photo

(Continued from preceding page)

pavement could be laid.

Before the design plans and specifications were drawn up, a subgrade test section was constructed to determine the maximum practical subgrade compaction. The results of the test indicated that a maximum practical compaction of 97 per cent modified AASHO density could be obtained using normal construction equipment and procedures.

Nine Soil Varieties

There are nine principal soil varieties on the airfield, all somewhat granular, with an optimum moisture content of between 9 and 12 per cent. Measured by the modified AASHO method, in which a 10-pound hammer compacts a soil sample with 55 18-inch blows, Corps of Engineers designers specified 92 per cent densities in the lower parts of the subgrade and 97 per cent in the upper portions. This subgrade compaction treatment varies from 6 to 16 inches in thickness over various parts of the field and is correlated with CBR characteristics.

The base course consists of 6 to 12 inches of granular material and 4 to 6 inches of select material. The top lift of the base course is a well graded crushed rock, minus 2 inches in size, with sand added for the purpose of improving gradation and lowering the PI. Coming from a crushing plant, it is practically all composed of angular limestone and dolomite particles.

Specifications for its compaction called for 100 per cent modified AASHO densities throughout and CBR laboratory-developed values of not less than 80 for the top base material. High densities were also required on the asphaltic concrete, with 92 per cent on the binder course and 95 per cent on the surface course. Densities were based on theoretical maximums.

The asphaltic concrete contains from 4.0 to 4.2 per cent 85 to 100 penetration AC bitumen in the binder course and from 5.6 to 5.9 per cent of the same material in the surface course. To insure proper surface density, the top course mix was made with approximately 51 per cent mineral aggregate passing a No. 10 sieve. The use of drag brooms after the laydown machine also was required, as was very heavy rolling by steel-wheel and pneumatic-tire rollers. All measurements for stability were made by the Marshall control method.

Caliche Shoulders

Another interesting design feature is the use of a caliche shoulder dust-palliative treatment developed, over the years, by air installation officers at Biggs Air Force Base. High winds and shifting desert sand dunes are an ever-present problem. Some dust palliative control experiments were conducted with asphalt, but the asphaltic membrane apparently invited capillary moisture, and vegetation soon appeared. In a blowing dust storm, any small shrub quickly caught an island of sand which would enlarge and stretch across the runway.

The air installation officers found that a 50-foot shoulder of native caliche rock along the airstrip and 25-foot shoulders along the taxiways could be placed easily and economically, and that desert vegetation would be almost nonexistent. This was because, when moistened and rolled, the caliche set up tightly. These shoulders gave off very little dust and did an excellent job of holding surfaces which normal winds would keep clean. In case of damage, the caliche could be repaired easily by the field's own maintenance men with one or two truckloads of material.

Practically all the grading consisted of picking up the 2 to 3 feet of granular topsoil and the 2 to 7 feet of caliche beneath, processing it with moisture, and reshaping it into suitable subgrade embankments. For this work, McKee used a pair of Euclid single-power scrapers push-

loaded in the pit by an Allis-Chalmers HD-20. In addition, he had a Caterpillar No. 12 motor grader, 3 Allis-Chalmers AD-40 motor graders, 4 Gebhard sheepsfoot rollers pulled by Allis-Chalmers HD-15's, a 50-ton Bros compactor, and a water-tank truck with its equipment.

Subgrade Thickness

The combined thickness of the two courses of subgrade varies from 10 to 20 inches, depending upon the type of material used and the wheel loads to be accommodated. Because of the variety of materials present, moisture content was very carefully controlled. Experimenting with various moisture contents and various types of compacting equipment determined that maximum compaction could be obtained with slightly under optimum moisture content. The sheepsfoot rollers followed by the 50-ton compactor proved adequate.

The development of 100 per cent densities in the subbase required even more rigid controls of moisture content. Northwestern solved the high density problem by working out certain definite laydown procedures which simulated laboratory methods almost to the point of duplication and by using the heaviest possible compaction equipment.

Crushed rock for the base courses was supplied under a mineral aggregate supply contract by Hugh McMillan, El Paso, from one of the most extensive quarry plants in the southwest. McMillan used a Pioneer and a Cedarapids crushing plant, each equipped with a primary jaw crusher, a triple-roll crusher, and the necessary screens, shakers, and conveyors. Production ran as high as 2,200 cubic yards per 10-hour day.

Laying the Subbase

Crushed material was dumped along one side of a 25-foot strip in a quantity sufficient for a 3-inch lift. These 3-inch courses were average for the job, though 2 and 4-inch courses were used for any special thickness requirements.

After a long run of the crushed rock was dumped, three Caterpillar No. 12 motor graders went to work on the dry and wet processing. The former consisted of knocking down the loads and making one or two passes to eliminate segregation and develop an intimate blend of the particles. When this was done, the material was stacked in a windrow along one side of the 25-foot strip. Then the motor graders spread the material over the strip, consuming a section of the windrow in three passes. While this was going on, sufficient water to bring the moisture content up to 5 per cent was added by a 2,000-gallon and a 3,850-gallon truck-mounted tank.

The laboratory optimum moisture of the material, which is usually measured without the coarse rock particles included, was approximately 5½ per cent. By laying the material slightly on the dry side, 100 per cent compaction was possible with a great deal of rolling. Generally, a 13-wheel 10-ton Bros Wobble-Wheel pneumatic roller was used on the first 3 inches of the base course over the subgrade. This was necessary because the 50-ton compactor had a tendency to rupture the upper soil structure. Once the first 3-inch course was down, the 50-ton roller did an excellent job on succeeding lifts.

Compaction and Priming

Five—and in a few stubborn cases, more—passes of the 50-ton roller were required. A Caterpillar No. 12 motor grader tight-bladed the surface of the subbase, and a 12-ton Huber three-wheel steel roller put on the finishing touches in preparation for the MC-0 asphalt primer. No binder or surface course was laid on the primer for 48 hours or until penetration into the base course was completed and volatiles had evaporated.

The hot-mix assignment was one of the largest Northwestern has handled. The 210,000 tons was produced by a Standard RB 5,000-

(Continued on next page)

A closeup of the steel-bristle drag brooms mounted on an angle iron. These brushes, lasting longer than fiber brushes, are also easier to clean.

U. S. Air Force Photo

(Continued from preceding page)

pound batch plant. It was an all-electric stock model that made use of natural gas firing by means of Hopkins burners. A Simplicity air washer was the only piece of equipment added to the plant after it was delivered from the factory. A Cleaver-Brooks Peak Temp oil booster automatically regulated the heating of the asphalt. The batch plant was located about a mile and a half from the air base. A natural-gas main was 300 feet from the setup, a water line was 150 feet away, and electric power lines were 100 feet distant.

The pugmill rams of the plant were operated by air from an Ingersoll-Rand Gyro-Flo 105-cfm compressor. Cosden asphalt in 85 to 100 penetration grade was trucked in and stored in a pair of 10,000-gallon horizontal steel tanks hooked to the circulation system by two Westinghouse-driven Viking 3-inch asphalt pumps. An interesting innovation was that the 200-mesh system through which fines are normally added was reversed to draw off a slight excess of fines which existed in the aggregate used by the plant.

Charging the Batch Plant

A four-bin separation was pulled to produce the hot-mix from three sizes of crushed rock aggregate, ordinary sand, and desert blow sand. This aggregate was also supplied by McMillan. Stacked in the various piles, the different sizes were loaded into the plant's bins by a Bucyrus-Erie 38-B clamshell. The rock was generally dry at the time the bins were charged, and it seldom contained more than 1½ per cent moisture. The plant dryer was used mostly to heat the aggregate to between 325 and 350 degrees F. The plant produced about 180 tons per hour. The hot-mix was weighed before leaving the plant area and was hauled to the paving site uncovered.

Special planing was done to the original runway where it was widened, in order to joint the new asphalt material into the old so that there would be no featheredging. Pavement Planing Co., Inc., Los Angeles, supplied a Caterpillar motor-grader-mounted burner and planing device for this purpose. The machine was equipped with a conveyor to load the planed material into waste trucks. It moved down the runway and made a square 1½-inch cut approximately 35 feet from the center line. The cut was tapered to zero at the pavement surface in a distance of from 24 to 30 feet. By tying in the new pavement courses to the 1½-inch square cut in the old slab, a durable joint was developed and succeeding courses were blended into the final slope.

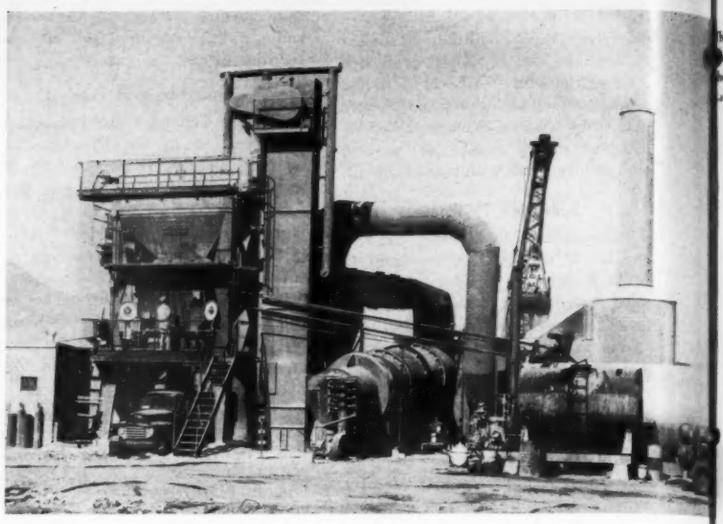
Steel bristle drag brooms followed the Barber-Greene finisher to improve the surface texture of the top course. After considerable research, the Corps of Engineers has found that a light dragging or brushing of an asphalt surface just behind the laydown machine and ahead of the first roller pass will eliminate the appearance of small open checks and minor voids.

Dragging Experiments

The first experiments were with ordinary fiber-bristle brushes mounted on a 2 x 4 timber 3 feet behind the finisher. But this method left 2-inch gaps between the brooms. The brooms were then tightened and the bristles slanted about 15 degrees off the vertical, with the first bristles touching the pavement. This improved the surface texture, but it was often necessary to clean the brushes in kerosene at the end of a run, and there was considerable trouble with the timber mounting, which warped in the intense heat.

These drawbacks were eliminated by the use of steel-bristle brushes mounted on a 3 x 3 x ¼-inch angle iron. The steel bristles last longer than the fiber, they do not warp, and they are much easier to clean.

After the dragging, compaction was achieved by a Galion three-wheel steel roller, one to two 13-wheel pneumatic rollers, and a Buf-



This Standard RB 5,000-pound asphalt plant produced the 210,000 tons of hot-mix used to convert the medium-bomber airstrip at Biggs Air Force Base, El Paso, Texas, into a heavy-bomber runway. *Ray Day Photo*

falo-Springfield three-axle tandem machine ballasted by 16 tons. These rollers were operated closely behind the laydown machine. When they were idle, they were parked on the new asphalt so that the dents they left could be ironed out.

Paving operations continued on schedule last summer even when the temperature soared to 107 degrees. In fact, it is believed that even better surface textures were developed during the hot weather than have been possible during colder weather. Asphaltic overlay on the existing pavements varied from 2 to 6 inches. To control the surface as well as to produce a level-up course, grab lines were established for the laydown machine. Nails were set a minimum distance of 25 feet apart, their heads driven to correct grade, and string lines run between them.

The caliche palliative for the shoulders was loaded by dragline from pits on the air base. It was laid by trucks just outside the runways and taxiways. After motor graders blade-mixed it, water was added, and it was cut and laid out with the help of the Bros Wobble-Wheel roller. The procedure was the same as that used to lay highway bases. The layers were bonded and compacted to at least 90 per cent density at optimum moisture content.

Kenneth B. Webb was general superintendent for the Northwestern Engineering Co. The entire project was under the supervision of the District Engineer, Albuquerque District, U. S. Army Corps of Engineers. THE END

HRB Reports Are Issued On Roadside Development

Now available in booklet form are two Highway Research Board reports on roadside work, "Roadside Development" and "Mechanization of Roadside Operations", together with a third publication, "Engineering Applications of Soil Surveying and Mapping".

"Mechanization of Roadside Operations" contains pictures and descriptions of more than 50 pieces of equipment commonly used in roadside work. Each machine is listed under the types of work it performs. Balers, brush disposal equipment, brush mowers, excavators, graders, hole diggers, and leaf and trash collectors are among the machines whose effectiveness is discussed. The 27-page booklet, Special Report 16, is priced at 60 cents.

"Roadside Development", an 81-page publication containing the 21st annual report of the board's committee on roadside development, also discusses the mechanization of roadside operations and contains reports on the influence of soil mixtures on turf growth, roadside litter, tree care, and the inhibition of grass growth. Sections include a synopsis of the use and protection of roadsides, a report on stabilized turf shoulder, and a discussion of planning and management of roadside vegetation. This booklet is Publication 286 and sells for $1.35 per copy.

The third publication issued by the board, "Engineering Applications of Soil Surveying and Mapping", is the sixth of a related series. It follows the general pattern of previous bulletins, presenting information on the state of geologic and agronomic mapping in the individual states. Included are papers on development and application of soil engineering in Michigan, the application of soil survey data to highway engineering in Kansas, and the use of soil survey data in highway design. This is Bulletin 83 and is priced at $1.05.

Each of these publications can be ordered from the Highway Research Board, National Research Council, 2101 Constitution Ave., Washington, D. C.

Heavy Equipment Shipped For Alaska Pipeline Job

Hundreds of thousands of tons of heavy construction equipment, machinery, building materials, and other supplies for the Haines-to-Fairbanks pipeline project are arriving at Alaskan ports for construction of the 621-mile petroleum pipeline which is expected to be under way by June.

Joint venture firms awarded the $29,001,281 contract are Williams Bros. Construction Co., Tulsa, Okla.; McLaughlin, Inc., Great Falls, Mont.; and Marwell Construction Co., Vancouver, British Columbia. British firms are supplying the 8-inch steel pipe for the portion which crosses Canada, while U. S. firms are supplying the pipe for the Alaskan miles.

Stewart & Lloyd, London, is supplying 5,500 tons of pipe. Jones-Laughlin Steel Co., Aliquippa, Pa., and National Tube Co., Pittsburgh, Pa., are suppling 75,000 and 4,000 tons, respectively. Heavy construction equipment arriving for the project includes four Caterpillar D8 tractors, a Caterpillar motor grader, 28 diesel-powered pipelayers, bulldozers, and mammoth diesel shovels, all being shipped by the Northern Commercial Co. from Peoria, Ill.

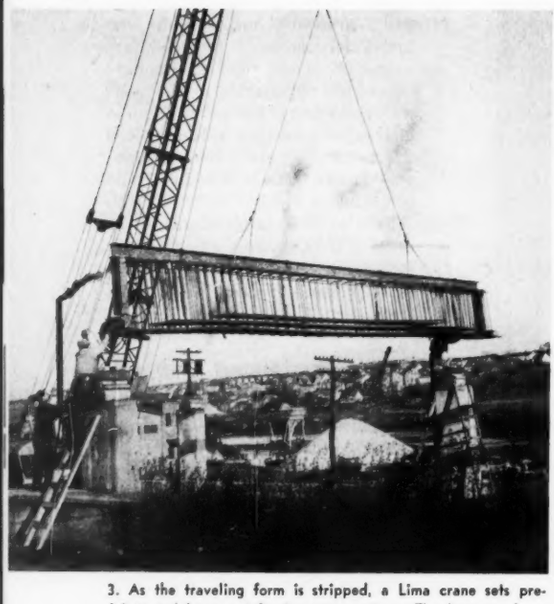
Crews are now clearing sites for construction camps at both ends of the projected pipeline. Personnel of the Alaska District Corps of Engineers are assisting contracting crews in the project, which will provide a piping system to carry aviation, motor, and jet and diesel fuels to military bases located in the interior of Alaska.

1. Vacuum processing of deck concrete for this double-deck highway permits a traveling form to be stripped from the 162-foot-long monolithic section after 2½ days. *C&E Staff Photos*

Vacuum Processing Paces Double-Deck Highway Job

The method quickly removes excess water from concrete, giving it enough strength to permit early form stripping

By ALBERT C. SMITH, Field Editor



3. As the traveling form is stripped, a Lima crane sets prefabricated beam reinforcing across piers. The bars are hung from a steel beam to prevent them from sagging before the form is lifted.

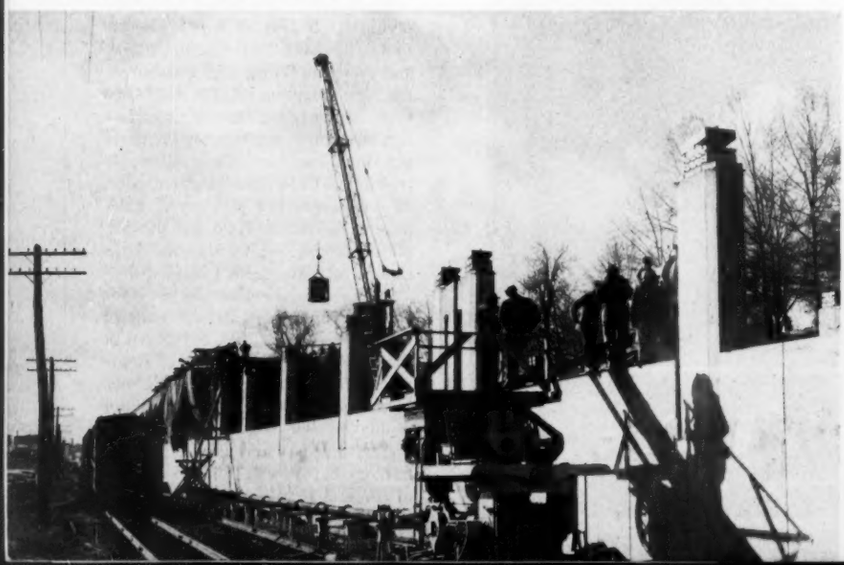
4. The traveling form has now been moved ahead, the sides are ready to be swung into place, and the entire unit lifted hydraulically.

By Vacuum Processing freshly placed concrete in the upper deck of a double-deck highway in Newark, N. J., a contractor induced sufficient strength into the concrete early enough to permit a traveling form underneath to be stripped after only 2½ days.

Except for shutdowns in cold weather, National Structures Corp., New York City, poured a 162-foot-long monolithic section of beams and deck every Friday, stripped the traveling form on Monday, moved it ahead on Tuesday, and poured again on Friday. The method was used ten times on the half-mile viaduct, reducing form costs and pushing the deck work far ahead of schedule.

About two-thirds of the 550 yards placed on Friday was handled by a Pumpcrete machine, and the other

5. Two days after the form is moved up, concrete is placed in the four-span section of beams and deck. An 8-inch Pumpcrete places about 50 yards per hour, while a crane and buggy system places about 25 yards per hour. Railroad tracks nearby prevented the use of more than one crane.



6. Concrete for the buggy system is emptied into a 6-yard hopper by a Lima crane as an empty ready-mix truck pulls through an open section in the traveling form.

2. A Sasgen wheel-mounted derrick drops a hinged side of the deck form. The entire unit is stripped, lowered hydraulically, and moved ahead in one day.

third was buggied from a 6-cubic-yard hopper fed by a 1½-cubic-yard crane. The deck was screeded, vacuum processed, finished, broomed, cured, covered with salt hay, then allowed to set over the weekend. When the crews returned to work on Monday morning, they collapsed the sides of the deck form, lowered the entire unit hydraulically, and moved it ahead on rails to the next position. During the following four days, the form was raised and braced, the reinforcing bars set in place, and concrete-handling equipment moved into position. On Friday, another pour was made, and the cycle started over again.

Vacuum Processing

The key to the method, of course, was the use of vacuum processing, a development of Vacuum Concrete, Inc., Philadelphia, Pa. Ordinarily, such a heavy deck could not have been stripped for about 14 days. But vacuum processing removed enough excess water from the fresh concrete to induce a minimum strength of 3,500 psi after 60 hours.

Soon after the $1,470,000 contract was awarded in the spring of 1953, the vacuum processing plan was presented to the New Jersey State Highway Department by National Structures, which had used the process successfully in the construction of the Battery underpass in New York City. Since the method had never been used on bridges in New Jersey, officials first called for several rigid tests.

In one test, a 9 x 13-foot slab of concrete 22 inches thick was poured, vacuum processed, and allowed to set. The next day 6-inch cores were cut out and sent to the laboratory. All specimens tested after 48 hours showed strengths over 3,500 psi. The department, therefore, approved the method and allowed stripping after 60 hours.

As a field check, however, the contractor was required to cast and vacuum a 26-inch square slab 20 inches thick on the day of each pour. After 60 hours, the Jersey Testing Laboratories determined the strength; if it was over 2,500 psi, the form was stripped. In nearly every case, this strength was surpassed.

Suction Mats

Essentially, vacuum processing is a method of removing excess mixing water from freshly poured concrete. It involves no driers, admixtures, or special cements.

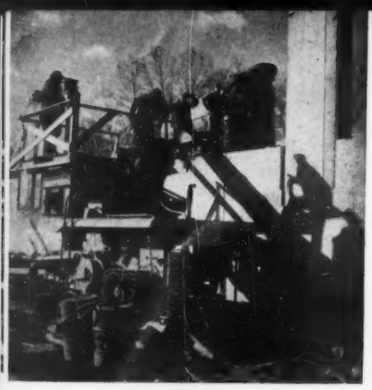
On the Newark job, water was drawn out of the concrete by 3 x 4-foot suction mats made of ¾-inch plywood and metal screens covered with cloth. A piece of one-inch angle around the edge reinforced the 30-pound units. To insure a tight seal, a rubberized strip around the perimeter of the mat was pressed into the concrete. Each mat had attached to it a nozzle and valve one inch in diameter, and a one-inch vacuum hose which ran back to a 2-inch-diameter pipe manifold behind the mats. Suction was created by a vacuum pump mounted on a truck stationed below the deck.

Mats were placed in two rows across the deck about 20 feet behind the freshly screeded concrete. After every 20-minute period of processing, mats in the rear row were picked up, one at a time, and placed

(Continued on next page)

7. The rear row of suction mats used in vacuum processing are moved ahead of the first row after 20 minutes. Workmen stand on the processed concrete without sinking.

8. Rodgers 50-ton hydraulic jacks keep the form at the required grade during a pour. Sonic-Ray propane gas heaters were used in cold weather.



Concrete is chuted from a ready-mix truck into the Pumpcrete hopper, where it drops in front of two pistons that push it through an 8-inch pipe to the deck.

(Continued from preceding page)

in front. As a row was moved up, a workman removed surface ridges with a Whiteman rotary-type blade finisher. A broom finish was then worked into the surface, and a Corcrete seal applied.

Double-Deck

The job was unusual in many ways. The double-deck design—a first for New Jersey—was required to sandwich the viaduct between a cemetery and a railroad. This half-mile structure is one of several projects now being constructed to close the last gap in Route 21 where it parallels the Passaic River in Newark. Southbound vehicles will travel the 35-foot-wide upper roadway, and northbound traffic, a 33-foot-wide lower roadway.

Traveling Form

As soon as approval to use vacuum processing was granted, National Structures Corp. set out to adopt a previously used traveler to the viaduct job. Naturally, it had to be big enough to handle a full day's pour, and in this case, that meant 4 rigid-frame spans with a total length of about 160 feet and a width of 42 feet. This 4-span section was also desirable because it extended between expansion joints and repeated itself ten times along the length of the viaduct.

Many special features had to be built into the timber form and its steel traveler to fit the unit for the job. In the first place, it had to be capable of lowering itself more than 4 feet to clear the cross beams when it was moved ahead. Also, it had to be open to allow transit-mix concrete trucks to pass under it after unloading their concrete. Other problems were involved in making the sides of the deck form collapsible so that they cleared the piers when the traveler moved ahead.

Basically, the traveler consisted of four separate steel-frame units, one for each span. Each unit was mounted on four wheels riding steel rails that were 25 feet 6 inches apart. The four units were connected by steel members so that they all moved together.

Irregular Shape

Because of the two-way haunch of the deck, much tricky form work was required. Longitudinally, the decks are 23 inches thick at each beam and taper to a flat middle section 17 inches thick. In a transverse direction, they have three different slopes. The two outside spans are 36 feet long, and the inside spans are 40 feet long.

Plywood form facing on top was nailed to 4 x 4's and 2 x 4's. Haunching was built up by 2 x 8's. This timber formwork rested on steel channels supported by the main truss frames, and fabricated mostly of 4-inch angles and channels. The timber formwork and steel supports for the concrete cross beams hung from cantilevered steel sections between each traveler unit.

Lifted Hydraulically

The form and traveler were raised and lowered by 24 Rodgers 50-ton hydraulic jacks, six used for each of the four traveler units. The 2-inch-diameter rams had a 49-inch travel. Two Rodgers pumps powered by Wisconsin engines maintained a line pressure of about 8,000 psi throughout the system. Hydraulic fluid was pumped to the jacks through ½-inch steel tubing and flexible hose.

For best results, the contractor lifted or lowered only one traveler unit at a time, and each unit was lifted a maximum of 6 inches. When all four units were moved 6 inches, the process was repeated again and again until the entire form was at the required grade. Lifting one unit higher than 6 inches would have unbalanced the loading and caused binding inside the jacks. The complete lifting operation usually required less than four hours.

When the lifting was completed, timber shores were added to assist the jacks in maintaining the required grade during the pour. The hinged sides, which were dropped to allow the form to clear the piers, were then raised and shored from the walls below with 2 x 4's. Raising

and lowering the hinged sides was done efficiently by a Sasgen wheel-mounted derrick which rode the deck. After a sling was thrown around a cleat on the hinged side, it was connected to the derrick's wire-rope line. A hand-operated winch could then easily raise or lower the hinged side.

Reinforcing Cages

On Monday, as the form was being collapsed and lowered, crews set the next section of track and placed the prefabricated cages of cross-beam reinforcing between the piers. Because of the size and weight of the reinforcing bars in the beams, National Structures Corp. decided that prefabrication would speed placing of the bars.

Each of the reinforcing units was about 42 feet long. They consisted of three levels of heavy 1¼-inch bars in the bottom and one level of ⅝-inch bars on top, all held together with 5-foot-high stirrups.

National's big problem was to keep the erected reinforcing cage intact until the form underneath was raised to support it. This problem was solved by hanging the cage from a 10-inch steel H-beam. Four ratchet-type chain hoists tied the heavy bottom bars to the beam before erection. A timber post was set under each end of the beam to act as a temporary column. Then the Lima crane lifted the unit from the ground and set it down onto the briquettes placed on the steel rockers. When the crane lines were released, practically no sag was visible in the cage.

The steel traveler was then pulled up to the new section and lifted hydraulically. When briquettes placed along the bottom of the beam forms made contact with the bottom level of reinforcing bars, the weight of the cage was then carried by the form, and the steel beam and timber posts were removed.

Concrete Placing

Concrete placing also presented a big problem to the contractor. Because the cemetery was on one side and the railroad on the other, National was restricted to the use of one crane, which was able to operate only in the middle of the viaduct. Naturally, one crane was inadequate to place 550 yards in 8 hours.

The answer to the problem was Pumpcrete. The contractor set up a brand new 8-inch machine on a spur track of the railroad near the wall of the viaduct. The big unit placed from 40 to 50 yards per hour on about two-thirds of the deck. The other third was placed with a crane and buggy system that averaged 25 to 30 yards per hour.

Ready-mix trucks drove inside the viaduct walls to a timber ramp opposite the Pumpcrete machine. From the top of the ramp, the trucks chuted the Darex air-entrained concrete down into the Pumpcrete hop-

(Concluded on next page)

Surface ridges in the concrete deck are removed by a Whiteman rotating finisher which works just behind the vacuum processing mats. In the background, Whiteman screeding machines level concrete. With vacuum processing, the contractor was able to pour a 162-foot deck section every Friday.

(Continued from preceding page)

per. Then the two reciprocating pistons pushed the concrete through the 8-inch pipe to the deck, where workmen used a swivel-end section of pipe to direct the flow.

Meanwhile, other ready-mix trucks unloaded into bottom-dump buckets and then drove straight out through the traveler. The buckets of concrete were hoisted by the Lima crane and emptied into a 6-yard hopper set on a timber tower next to the deck. Workmen loaded Jackson buggies from the hopper and shuttled back and forth on movable runways.

Concrete from both the Pumpcrete pipe and the buggies was spread by two Whiteman screeding machines 20 and 26 feet wide that overlapped along the center line. The screeds rode wood strips supported on metal chairs. Finishers pulled the strips out of the concrete when the screeds had passed. In front of the screeds, the concrete was consolidated with four Mall barrow-mounted vibrators.

After finishers leveled the surface with wood floats, the vacuum processing previously described was applied. The broomed surface was sprayed with Curcrete and covered with a mat of salt hay.

Personnel

National employed a maximum of about 90 men on the job. Work will be completed this month. Ralph J. Taylor is superintendent for National Structures Corp., which is headed by Joseph Meltzer, president and general manager. John J. Koffler is principal engineer for the bridge division of the New Jersey Highway Department, which is headed by Morris Goodkind, director and chief bridge engineer. THE END

If you need information on equipment, we'll be glad to help you. Just fill in and send us the card at page 18.

Highway Officials Oppose Tax Clause

EARLY LAST MONTH, the Association of Highway Officials of the North Atlantic States called upon Congress to remove the contingency in the modified McGregor Bill, so that funds for the national system of interstate highways would not be dependent on the continuation of the 2-cent Federal gasoline tax.

Meeting March 10 through 12 at the Shoreham Hotel in Washington, D. C., the AHONAS voiced approval of increased Federal aid, regardless of any drop in the tax.

The McGregor Bill would provide $600 million of regular Federal aid annually, plus an additional $200 million for the interstate system. This year, only $500 million will be available to the states.

Nearly 1,000 representatives from the north Atlantic states and the District of Columbia heard several noted authorities warn that, even with increased appropriations, the nation's highways are wearing out more rapidly than they are being replaced. A. E. Johnson, president of the American Association of State Highway Officials, and R. M. Reindollar, president of the American Road Builders' Association, agreed that America's highway program is losing ground. Reindollar pointed out that adequate highways can be built only if a vigorous 10-year plan calling for an annual national expenditure of $8 billion, instead of the present $5 billion, is set up now.

Turning to some of the technical problems of road building, F. Burggraf, director of the Highway Research Board, reviewed the most recent research being carried out to determine the effect of loads on pavements. The WASHO road test in Idaho, he reported, is now in operation again, and final results will be announced in a year.

C. N. Conner, also of the Highway Research Board, advised engineers to keep abreast of the latest developments in flexible pavements.

The increasing demand by city, county, and state highway departments for more radio frequencies prompted a regional meeting of the AASHO. H. A. Radzikowski of the Bureau of Public Roads reported that 147 highway departments are now using radio communication, and many others are now applying for licenses. Because of the interest in radio, he said, it is important now to adopt a systematic program of allocating frequencies. He submitted a plan which would divide the 40-kilocycle band to provide 27 separate frequencies—instead of the existing 14—for each state.

Taking a stand on a new Federal-Aid problem, the AHONAS passed a resolution opposing any proposal to use Federal-Aid funds to pay the cost of relocating public utilities located within state highway rights-of-way.

J. N. Robertson, director of highways for the District of Columbia, was elected president of the AHONAS for the coming year. R. H. McCain, chairman of the Maryland State Roads Commission, was elected vice president. A. L. Grover was re-elected secretary-treasurer, and K. D. Rice was re-elected assistant secretary-treasurer. THE END

Convention Calendar

April 5-7 American Society of Lubrication Engineers
Annual Meeting and Exhibit, American Society of Lubrication Engineers, Netherland Plaza Hotel, Cincinnati, Ohio. William P. Youngclaus, Jr., administrative secretary, 84 E. Randolph St., Chicago, Ill.

April 6-8 Ohio Highway Engineering Conference
Ohio Highway Engineering Conference, Museum, Ohio State University, Columbus, Ohio. Emmet H. Karrer, professor of highway engineering, Brown Hall, Ohio State University, Columbus 10, Ohio.

April 7-9 South Dakota Highway Short Course
South Dakota Highway Short Course, Union Building, South Dakota State College, Brookings, S. Dak. Emory E. Johnson, professor of civil engineering, South Dakota State College, Brookings, S. Dak.

April 13-14 American Institute of Steel Construction
Sixth Annual National Engineering Conference, American Institute of Steel Construction, Hotel Schroeder, Milwaukee, Wis. L. Abbet Post, executive vice president, AISC, 101 Park Ave., New York, N. Y.

April 13-14 Earth-Moving Industry Conference
Conference, Earth-Moving Industry, Pere Marquette Hotel, Peoria, Ill. J. W. Carter, Research Department, Caterpillar Tractor Co., Peoria, Ill.

April 19-22 Purdue Road School
Purdue Road School, Memorial Union Building, Purdue University, West Lafayette, Ind. Ben H. Petty, professor of highway engineering, Civil Engineering Bldg., Purdue University, Lafayette, Ind.

April 26-28 American Wood Preservers
Annual Meeting, American Wood Preservers Association, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. For information, write to W. A. Penrose, secretary-treasurer, AWPA, 839 17th St., N. W., Washington, D. C., and for reservations, contact C. C. Calvin, chairman Hotel Committee, AWPA Arrangements Committee, 887 Suburban Station Bldg., Philadelphia, Pa.

May 3-8 Concrete Reinforcing Steel Institute
Annual Meeting, Concrete Reinforcing Steel Institute, Boca Raton Hotel, Boca Raton, Fla. H. C. Delzell, managing director, 38 S. Dearborn St., Chicago, Ill.

May 3-8 Wire Reinforcement Institute
Annual Spring Meeting of the Board of Directors and Members of the Wire Reinforcement Institute, Boca Raton Hotel, Boca Raton, Fla. Frank B. Brown, managing director, Wire Reinforcement Institute, Inc., 1049 National Press Bldg., Washington 4, D. C.

May 4-6 Highway Transportation Congress
Fifth Highway Transportation Congress, Mayflower Hotel, Washington, D. C. National Highway Users Conference, 952 National Press Bldg., Washington 4, D. C.

June 9-12 National Assn. of County Officials
Meeting, National Association of County Officials, Ak-Sar-Ben Coliseum, Omaha, Nebr. Keith L. Seegmiller, secretary-treasurer, 1616 Eye St., N.W., Washington, D. C.

June 13-18 ASTM Meeting and Exhibit
Annual Meeting and Exhibit, American Society for Testing Materials, Sherman and Morrison Hotels, Chicago, Ill. Mr. G. A. Wilson, senior assistant editor, ASTM, 1916 Race St., Philadelphia 3, Pa.

June 15-18 American Society of Civil Engineers
Meeting, American Society of Civil Engineers, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. Don P. Reynolds, assistant to the secretary, 33 W. 39th St., New York 18, N. Y.

June 28-30 American Society of Landscape Architects
Meeting, American Society of Landscape Architects, Hotel Somerset, Boston, Mass. Bradford Williams, corresponding secretary, ASLA, 9 Park St., Boston 8, Mass.

April is Y.M.C.A. World Service Month. Your local "Y" can tell you how you can assist in this helpful overseas work. Or write to Y.M.C.A., 291 Broadway, New York, N. Y.

New Jersey's Parkway Schedules Opening

Midsummer will see the completion of a major section of New Jersey's Garden State Parkway, the 165-mile superhighway which will run almost from the New York State line in the north to Cape May at the southernmost tip of the state. A section of the $285,000,000 road, from Irvington to Atlantic City, is expected to open in about two months, and the portion from Atlantic City to Cape May will be opened the following month.

At the present time, work is being done on 135 miles of the highway in the ten counties through which it stretches. Progress made in constructing the road is documented in the second annual report of the New Jersey Highway Authority, which reveals that a total of $117,000,000 in construction contracts was awarded in 1953. The highway report, which Ransford J. Abbott, chairman, presented to Governor Robert B. Meyner, also listed 35 per cent of construction as finished and 81 per cent of anticipated contracts already awarded. As of the close of the year, 32 of the 177 bridges on the route were decked. Of the parkway's 282 structures, the largest is the $11,000,000 Raritan River crossing, on which steel is now being erected. During 1953, about 4,000 persons were employed by contractors and consultants working on the highway.

Current estimates envision a total of 52,833,000 vehicles using the parkway in 1955, the first full year of operation. Of this number, about 30,583,000 will be charged approximately $12,000,000 for the privilege of using the facility. Although the completed road will be in use in 1954, sections at its extreme ends will have only one dual roadway until revenues collected enable the extra lanes to be built.

It's Still a Bargain

"Historic American Highways", Volume II in a series on the development of highways, can be purchased for $4 from the American Association of State Highway Officials, 917 National Press Bldg., Washington 4, D. C. The price was stated incorrectly in last month's issue. Volume I, "Public Roads of the Past", is $3. Both books can be purchased for $6.

(Advertisement)

Operator's Pride Key to Low Shovel Maintenance

by R. G. THIBAUT
Service Manager, The Thew Shovel Co.

The pride of the operator in his job and his machine is the real key to low shovel-crane maintenance cost. If the operator takes enough pride in his machine and his job to see that proper lubrication and servicing is done on a regular schedule, costly shut-downs and repairs can be avoided.

All manufacturers want their machines to get the best of care—want them to serve the contractor well and safely throughout a long and trouble-free life. To that end they publish operator's manuals with preventive maintenance, adjustment and lubrication instructions and proper operation procedures. However, no one but the operator, or the master mechanic can see that these programs are carried out completely.

Easy-access grease fittings and simplified adjustments are provided to make this part of the operator's job easier. Permanent lifting capacities mounted in the cab make it easy to keep loads within safe limits. But, the operator himself is still the key to the problem, because he is the only one that can implement the planning that is done to assure trouble-free operation. If he really knows his machine, and maintains and services it as the factory recommends, and does not abuse it, operating and maintenance costs will be reduced to a minimum.

It is a standing joke that women do not read instructions on new equipment they buy such as washing machines, cleaners, etc. Service engineers can testify that some operators apparently never read their service manuals either—or if they do, they don't remember what they read—or don't care.

It all comes back to how much pride the operator has—in his job, in his machine, and in himself. That is what really gets the most out of a piece of equipment—at lowest operating cost.

After blasting for the spillway excavation, rock is loaded into a Euclid end-dump truck by a Bucyrus-Erie 88-B shovel with 3½-yard Esco dipper. In the background, a 54-B drag shovel with 2½-yard bucket fine-grades the bottom of the cut.

Ray Day Photo

Dam Spillway Yield to

WORKING AROUND the clock, five and six days a week if necessary, a joint-venture contracting team is racking up an impressive construction record at The Dalles Dam, Oregon, for the U. S. Army Corps of Engineers. In about ten months' time, hard-rock experts of Atkinson-Ostrander have blasted more than 2,000,000 cubic yards of the west's most unpredictable shooting from solid basalt.

Guy F. Atkinson Co. and Ostrander Construction Co. are the joint-venture contractors, and the yardage their men have moved will make way for the dam's massive 1,370-foot concrete spillway. Some of the yardage will also form various training channels. Later, part of the stockpiled material will find its way into some of the nonoverflow parts of the huge $350,000,000 multiple-purpose dam located three miles upstream from the town of The Dalles. The Atkinson-Ostrander contract for $14,500,000 covers only one segment of what ultimately will be one of the big important power-generating dams on the Columbia River. This contract calls for work on the spillway structure, together with appurtenant channel excavations in the spillway approach and tailrace areas. A pair of sizable earth and rock cofferdams, a steel pile cell-type connecting structure for the cofferdams, and a few minor items connected with the spillway are also in the contract.

The spillway itself is one of the key structures for the 8,700-foot earth, rock, and concrete barrier which will hold back the Columbia at this point. It is 1,370 feet long, and its gravity ogee section, reaching from elevation 65 to 120, is 55 feet high. The crest can be controlled by 23 tainter gates, each 50 x 42½ feet in size. Atop the spillway, a bridge will service the structure, and provisions will be made for a gantry crane, a crane track, and stop log. Altogether, the structure calls for detailed shooting for the removal of 600,000 yards of rock. The total amount of reinforced concrete in the spillway will come to about 350,000 cubic yards.

Below the spillway ogee is the conventional-type stilling basin with the still pool and baffles for energy

ield to Hard Rock Crews

Excavation of 2,000,000 cubic yards of rock is almost finished for The Dalles Dam's 1,370-foot structure on the Columbia River

Wood forms for The Dalles Dam spillway begin to rise from bare rock. The basalt, cut to neat lines and showing the sloping pattern of the drill holes, testifies to the effectiveness of the slicing shots used in the blasting.

Ray Day Photo

dissipation of water. Since the Columbia is between 200 and 275 feet deep just below both the spillway and powerhouse, no trouble is expected from undercutting. The huge spillway is expected to take care of practically any flow. It has a rated peak capacity of 2,290,000 cfs, and the maximum flow recorded is 1,240,000 cfs.

Cofferdams Built First

Before extensive work could be undertaken in the spillway proper, the contractors' crews first built several earthen cofferdams to prevent the area from being flooded at high river stages. Cofferdam C of this schedule called for a 38-foot-high embankment 1,800 feet long. Cofferdam D is an 800-foot structure of similar construction, ranging in height from 19 to 49 feet, depending on the contour of the natural ground beneath its base. Cofferdam F, 700 feet long, is from 27 to 37 feet high.

Each of the cofferdams was designed as an earthfill dam, with a compacted core of impervious silt which is found in pockets in the channel area, a supply supplemented by borrow pits in the immediate vicinity. The cofferdams were built with free-draining transition material and heavy rock blanket on the water side, and filter material spalls and heavy rock on the dry side. The impervious material was loaded to a fleet of dump trucks by a Bucyrus-Erie 54-B power shovel, while the heavy rock was taken from channel areas which could be excavated safely at this early stage of the work.

Connecting cofferdams C and F is a series of 11 steel sheet-pile cells, designed to form a continuous watertight area protecting spillway construction. Corps of Engineers' plans and specifications called for individual bedding of each pile section into rock. Divers placed bags filled with a mixture of cement and sand along the rock line to seal the sections after each cell was finished.

The 46-foot-diameter cells were driven from a floating derrick barge, while a Bucyrus-Erie 54-B crane with a 100-foot boom was used from the land side. Both rigs used McKiernan-Terry 9B3 double-acting

(Continued on next page)

Gardner-Denver wagon drills, equipped with Timken tungsten-carbide bits, drill blast holes on a 7-foot-square grid pattern. *Ray Day Photo*

(Continued from preceding page)

hammers. Steam power was supplied by horizontal boilers mounted on the floating craft and by portable air compressors on the land side. The pile sections were driven around circular templates to within a few inches of final grade. A special driving mandrel was then used to seat each pile separately.

As far as leakage is concerned, results have been good. There is always an unpredictable amount of seepage through rock fissures, but with a pressure head of 31 feet outboard of the cofferdam, there was only about 4,000 gpm for pumps to handle.

Huge Excavation Job

Of the 2,000,000-cubic-yard excavation for the spillway, approximately 600,000 cubic yards represented detailed drilling and rock removal needed to fit the spillway into the parent bedrock. The remaining 1,400,000 cubic yards consisted of leveling an approach channel through basalt and other earth formations, as well as completing certain channel excavation in the tailrace below the spillway.

Specifications for rock excavation in the spillway are so tightly drawn that a tolerance of only plus or minus 1 foot—from theoretical grade line to a foot below—is allowed in removing the material. To cut true ¼ to 1 slopes in hard basalt, drillers followed the usual procedure of spotting wagon drills and checking their slope with a template board. In spite of the job's difficulties, new explosives techniques were used and, in tests made on the job, the average 500 to 600-hour life of tungsten-carbide bits was greatly increased.

From the start, the Atkinson-Ostrander management was faced with a difficult job of equipment selection. One of the previous contractors, using large-diameter drills, had done a good job of mass rock removal. But because of the painstaking drilling required as neat lines were approached near the bottom of the spillway, Atkinson-Ostrander settled on conventional wagon drills. A sizable fleet was brought in and, at one time, there were as many as 25 machines working three 8-hour shifts daily. With the exception of four Joy wagon drills, all these machines were Gardner-Denver. A central air supply plant was erected on a rocky knoll overlooking the spillway site for two Gardner-Denver 550-cfm compressors and an Ingersoll-Rand 3,500-cfm machine. Compressed air at 125 pounds pressure was sent out to the job through 12-inch lines, then farmed out to the various wagon drills through multiple connecting "Christmas trees", each of which furnished air to five machines.

Drilling was standardized with Timken steel and Timken tungsten-carbide rock bits. Timken's engineering force, quick to eliminate the many troubles confronting the drillers, traveled to Oregon to make new designs. The result was a new tungsten-carbide rock bit, with the same type of tungsten-carbide inset, but shorter, heavier, and with less shoulder length. A test made on 32 of these stock model bits showed that they gave a greater average of linear feet of drilling before they were ready to be discarded. Starting with a diameter of 2½ inches, they could be reground up to 25 times before they were worn out.

One of the important factors in prolonging their life was the regular care given each bit. The bits were reground and shaped to original factory specifications by a Mine & Smelter Supply Co. bit machine, made in Denver, which was set up in a special shop. Here, facilities were also available for the replacement of tungsten-carbide inserts. With drill-

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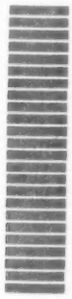

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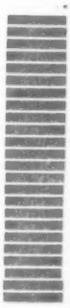

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ing in high gear, the shop turned out about 120 reground bits each 8-hour shift.

The drill-hole pattern in open areas was generally a 7-foot-square grid. In a few places 24 and 30-foot steel was used, but generally steel longer than 18 feet was not used. In the center areas, holes were loaded with slightly less than 0.75 pound of Columbia 40 per cent special gelatin powder. Western Minimax delays, up to No. 10, were usually used to pile the broken material and clear the way for cut shots along the detailed slopes. Center shots were exploded to within two or three-hole rows of the slopes. The broken material was then loaded out before slope drilling was attempted.

With this done, wagon drills were brought in, positioned along the ¼ to 1 slope lines, and checked with templates to make sure the drill holes penetrated along the slope line. These holes were bottomed at 1½-inch diameter and generally placed on 3-foot centers. The slope holes were carefully loaded. A half stick of powder was first placed in the hole and covered with 18 inches of sand, then quarter sticks of powder and 18-inch sand layers were alternated until the hole was filled. The shot was arranged so that the outer row of holes went first. The row over the toe location went next, followed by the slope shots. These slicing shots were so effective that many of the slopes still show halves of the drill holes. In some spots, the basalt rock is cut to neat lines by the powder, despite the rock's natural jigsaw fracture pattern.

Broken rock was loaded out by three shovels—a Bucyrus-Erie 120-B with a 5-yard Esco dipper, an 88-B with a 3½-yard Esco dipper, and a 2½-yard 54-B. A fleet of 18 Euclid end-dumps, each with 16-cubic-yard capacity, hauled the material away. For ease of handling, 12 of the units were equipped with Allison torque converters.

The haul road system, maintained daily by motor graders and sprinkler trucks, is 40 feet wide and permits good speeds. Most of the blasted rock was stacked away for future use in special disposal areas which have various berms and levels so that they can be reached easily.

One of the more spectacular disposal features was the placement of 600,000 cubic yards of rock in the Columbia River in a one-position dump. To do this, Atkinson-Ostrander used a mammoth steel barge, 370 feet long and 57 feet wide. One end was anchored against the shore so that it led out across the river channel. The water underneath its outboard rake was 300 feet deep before rock dumping was begun. Since the rock had to be placed at a minus 20 elevation, soundings were carefully made toward the end of this operation. Normal river level, as maintained by Bonneville Dam about 47 miles downstream, is plus 75. This means that there is approximately 95 feet of water over the fill.

While inaccessibility will delay the completion of some of the items, much of the excavation work, which began November 1, 1952, is entering its final stages. Completion of the spillway, if everything goes as scheduled, is now set for December of next year.

Meanwhile, preparations are going ahead on the erection of the concrete plant, batch plant, and the other facilities needed for this large concrete job. Specifications do not require concrete cooling, but they do require individual weighing of the various aggregates and cement in the concrete mix.

Concrete aggregates will be dug from a Government borrow pit about three miles from the spillway. They will then be trucked by 30-yard Southwest wagons to the processing plant, which will be located within the cofferdam area. The only waste will be No. 100 fines, which will be pumped into a settling basin within the cofferdam and removed later. The aggregate plant will be assembled from units used by Atkinson at Harlan County Dam in Nebraska and at McNary Dam in Oregon. Aggregates will be reclaimed from a 600-foot tunnel, then batched through a new Johnson fully automatic batch plant which has weighing devices meeting the new specifications set by the Corps of Engineers. Two Koehring 4-yard tilting mixers will do the mixing, and 4-yard Gar-Bro air-dump buckets will handle the material to the pour. Upstream and downstream from the spillway axis, two gantry-mounted Clyde Whirleys will be located to serve the job.

Wood forms used from rock level to typical sections will be made in the field. All typical formwork will be in 5 x 10-foot panels of steel, imported from Harlan County Dam. The ogee forms will be steel backed and have wood lagging.

The Atkinson-Ostrander joint spread is under the general supervision of A. H. Steiner, project manager. Joe McNabb is chief engineer; Guy Heimsoth, assistant project manager; Vernon Bradley, spillway superintendent; Carl Schmidt, drilling superintendent; and T. C. Yant, powderman. Day and swing-shift excavation spreads were handled by Joe Canto and James Daley. Bert Louis is master mechanic.

Col. Thomas H. Lipscomb, Portland district engineer, heads the Corps of Engineers forces. H. B. Elder is resident engineer on the project. THE END

New Plant for Clark

Construction has started on a new plant being built near Benton Harbor, Mich., for the Clark Equipment Co., manufacturer of construction equipment.

How-To-Do-It Book on Excavating Machines

Professional excavators and the thousands of sidewalk superintendents all over the country who follow this fascinating activity should welcome "How to Operate Excavation Equipment" as a long-awaited handbook. For Herbert L. Nichols, Jr., has written that rare thing—a technical manual designed for easy reading by the layman.

Into this 150-page book the author has packed a wealth of practical information about the machines that move the earth. Helen Schwagerman has supplied a further wealth of illustrations. The result is an accurate detailed primer of the operation and maintenance of machinery used in excavating, hauling, and grading.

From a detailed description of the five types of shovel—basic, hoe, crane, clamshell, and dredge—the author takes his reader up into the cab of the unit and proceeds to teach him operating procedure. The same careful attention is given to the other types of equipment.

Such less spectacular operations as dumping and loading, towing, and stump-pulling are also treated thoroughly. And there is an excellent glossary of more than 200 technical terms for the reader's reference.

The author has made a successful effort at avoiding unnecessary technical terms, and where he has found them necessary, he has given brief explanations in the language of the layman. When description of a machine or its operation tends to become lengthy and somewhat confusing, he supplies helpful summaries at the conclusion of the section.

Each discussion is well organized, with lists of suggested do's and don'ts for the operator. Seldom does the text instruct or advise without giving explanatory reasons. As already indicated, the style is easy, imaginative, and so familiar as to make the machines themselves the heroes of the book. This readability does not, however, detract from the serious painstaking tone.

There is complete data on maintenance and repair of the units described, and important space is given to safety features and operating hazards. Over and over again, the book stresses methods of protecting both workmen and machinery.

There are a few minor omissions which the author might correct in future editions. In an otherwise fairly complete section on pumping, he neglects to mention the wellpoint system, which is used not infrequently in certain types of dewatering operations. It seems, too, that such a complete treatment of excavation equipment might include some mention of the price ranges (in round numbers) of the units. Construction men may already know these figures, but they would be interesting to the layman.

In general, however, the book is a complete and entertaining treatment of the subject. The numerous illustrations (annotated drawings and diagrams) are very helpful, and there are tables here and there for more detailed information on operating procedure. The book would make an ideal textbook for a course in operating excavating machinery or for use as part of the curriculum in college civil engineering courses.

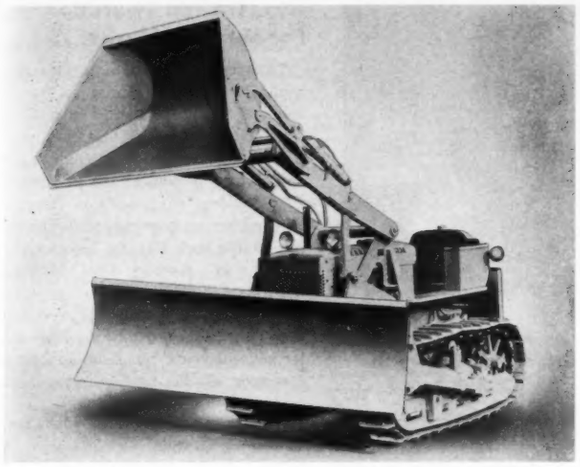
Virtually every type of implement from power shovels to air drills is discussed and illustrated, and the reader is given simple step-by-step instruction in the operation of each tool. Major sections are devoted to revolving shovels, conveyor machinery, tractors and dozers, tractor loaders, hauling units, and graders and loaders.

It is probably safe to say that no other industry holds such fascination for the man in the street as this. For him, and for his wide-eyed sons, this book is a Baedeker to the world behind the construction fence.

A graduate of Columbia College, New York, N. Y., Mr. Nichols has operated an excavation and grading business in Greenwich, Conn., for 15 years. He also did excavation work in South America and the Pacific Theatre for the army and as a member of the Seabees during World War II. He traveled to many parts of this country, Mexico, and Canada gathering material for this book.

Mr. Nichols and his wife, Dr. Hazel J. Berglund, are co-authors of the controversial medical book, "It's Not All in Your Mind".

"How to Operate Excavation Equipment" is available from North Castle Books, 212 Bedford Road, Greenwich, Conn., in paperbound ($1.50), cloth-bound ($2.50), and leatherette-bound ($3.00) editions. It is a condensation of the forthcoming reference book, "Moving the Earth", scheduled for publication later this year.



The new Terra-Builder, a dual-purpose crawler-mounted earth-moving unit.

Self-Propelled Loader And Bulldozer Unit

■ A new and larger Terra-Builder, a self-contained earth-moving unit consisting of a crawler-mounted tractor with a ¾-yard digging bucket and 7-foot 4-inch angle-blade dozer or 6-foot bulldozer, has been announced. This combination machine equipped with dual attachments fills the earth-moving needs of the medium-size contractor with one machine. This Terratrac machine is light enough to be moved on any light dump or stake truck. It is made by the American Tractor Corp., 800 Fort Wayne St., Churubusco, Ind.

The bucket operates as a digging loader, leveler, material-handling loader, and backfiller. It is tapered for self-cleaning in even the stickiest soils.

The independent angle-blade dozer or bulldozer attachment incorporates the design features of larger equipment. Close-coupled direct-hydraulic linkage permits precision performance when pushing heavy loads, leveling land, or grading.

For further information write to the company, or use the Request Card at page 18. Circle No. 236.

Elevator-Belt Handbook

■ An engineering handbook on elevator belting has been published by the B. F. Goodrich Co., Akron, Ohio. The new handbook describes and illustrates types of belt bucket elevators, gives factors for belt selection, outlines procedures for engineering the correct belt, and describes belt construction features.

In a section devoted to belt installation, information is given on bucket spacing and belt punching, minimum bucket spacing, bucket punching dimensions, tables of standard buckets, methods of belt splicing, elevator belt takeup, and pulley lagging.

Convenient tables refer to weights of materials handled, holding properties of various fabrics, the determination of belt weight and thickness, drive factors, sines of elevator slope angles, belt speed, belt plies needed for tension requirement, pulley diameters, belt quality, and cover thickness. Also included is a suggested specifications form which lists engineering information helpful in ordering elevator belts.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 237.

Bondmaster 158 C, a new adhesive, is being brushed on the inside of pipe before the addition of a new section. The adhesive is said to provide better anchorage of rubber gaskets to concrete pipe even under extreme climatic conditions. A further feature is that it can be applied uniformly, overcoming even hot weather difficulties due to evaporation of solvents. Smoother and faster troweling in the field are other characteristics. For further information write to Rubber Asbestos Corp., Dept. P, 225 Belleville Ave., Bloomfield, N. J., or use the Request Card at page 18. Circle No. 315.

Retractable Wheels Improve Portability Of Tandem Roller

■ The 4 to 6-ton variable-weight Galion tandem roller now has a set of hydraulically retractable, roller bearing, rubber-tired transport wheels. These permit the roller to be towed safely by any truck.

A simple fingertip hydraulic control raises the complete roller off the ground. A built-in hydraulic jack in the truck hitch raises the compression roll, and the retractable transport wheels raise the steering roll. Both hydraulic operations are powered by an engine-driven pump.

Both steering and compression rolls can be filled with water ballast. With its variable weight, the Galion 4 to 6-ton tandem roller is reported to fill any specification requirements for compressions ranging from 144 to 206 pounds per inch of roll width.

Other features mentioned in the specifications are: hydraulic steering, spur-gear final drive, constant mesh transmission, extra-large-diameter compression roll, and a 25-hp gasoline engine.

For further information write to the Galion Iron Works & Mfg. Co., Galion, Ohio, or use the Request Card that is bound in at page 18. Circle No. 188.

Wheel-Mounted Loader Has Turning Flexibility

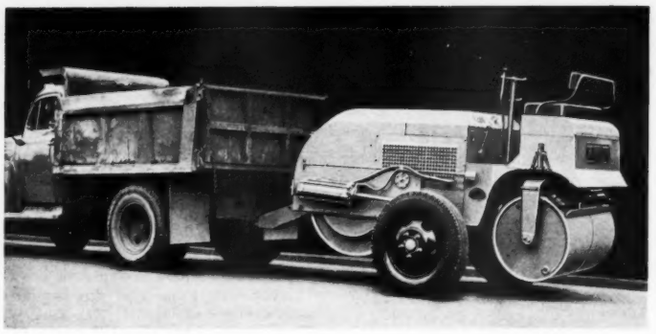
■ An integrally built front-end loader is shown in literature from Mixermobile Manufacturers, 8027 N. E. Killingsworth, Portland 20, Oreg. The Scoopmobile Model LD-10 loader features the Power-R-Flex coupler that is said to permit smooth operation over uneven ground and to allow full power and steering control on all four wheels in any degree of turn and twist.

This flexibility derives from a center-pin steering coupling that hinges the two power axle elements together. This allows the two drive axles an 18-inch oscillating twist, with full power on all four wheels retained, according to the literature. The design uses positive drive between both axles and also permits four-wheel steering with one active universal joint. A planetary drive with 3-to-1 gear reduction supplies positive power.

The bucket capacity of the loader is 1⅝ cubic yards measured struck and 2 cubic yards heaped. A 180-hp engine coupled with a high and low-range power-divider transmission provides 10 speeds forward and reverse, with road speeds up to 25 mph.

The literature also illustrates a number of attachments for the loader. Lift forks shown have a 13-foot lift height. A backfill blade, which attaches directly to the boom arm, is 96 inches wide. For heavier blade work, the Model LD-10 can be equipped with a regular 96-inch dozer blade that attaches to the chassis, to give a loader-dozer combination. A 1-cubic-yard concrete hopper and a 6-foot crane boom are other attachments available.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 264.



◀Transport wheels are the newest features of the Galion tandem roller.

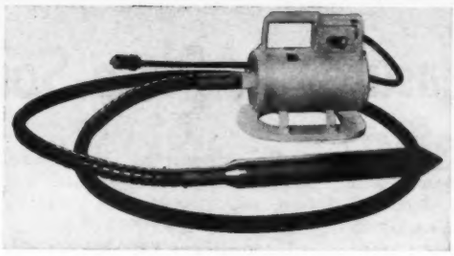
New Timken Operation For Mexican Market

Timken Roller Bearing De Mexico, a new company formed to handle sale of products manufactured by The Timken Roller Bearing Co., Canton, Ohio, has opened sales offices and a warehouse in Mexico City. Complete stocks of Timken tapered roller bearings and Timken removable rock bits are being maintained to service the Mexican market.

A. E. Porter, who has represented the Timken organization in Mexico for several years, has been appointed manager of the new company.

Motor-Driven Vibrator Works Dense Concrete

■ A new model concrete vibrator said to maintain its kick and speed in dense concrete is announced by the White Mfg. Co., 1227 N. Beardsley Ave., Elkhart, Ind. The Model ME-13 is powered by a new small Universal motor rated at 2 hp but developing almost 2¾ hp. This motor operates at high speed on 110-volt ac current of any cycle and on dc. It does not require a special high-cycle generator. Increased impact, for faster vibration and placement of concrete, is obtained with a heavier off-center rotor operating without excessive speed. Normal speed is from 7,500 to 8,000 rpm. The manufacturer points out that this speed avoids cavitation in concrete caused by unduly high speed when the cement cannot flow rapidly enough to follow the vibrator.



The White Model ME-13 vibrator is reported to maintain its speed in dense concrete.

The new model vibrator is mounted either on a rigid flat base or on a swivel base that keeps the motor above ground so that dirt and sand cannot enter. The head is driven by fully interchangeable drive sections of 7 and 12-foot lengths. No special section is required for the vibrator or for attaching the grinding spindles.

A feature of the White flexible drive is its compensating joint which does not separate in operation. It can be used in any length for any depth of form.

For 220 and 440-volt current, the new vibrator is furnished with a belt-driven countershaft for high speeds.

The White Mfg. Co. also produces a line of concrete vibrators driven by one-cylinder air-cooled engines. Models M-12 and M-13 are powered by 4.6 and 6-hp Wisconsin engines, respectively. Models M8 and M9 are equipped with Lauson engines.

For further information write to the company, or use the Request Card at page 18. Circle No. 200.

Bin-Level Indicator

■ A simple electronic bin-level indicator is described in literature from Robins Engineers Division of Hewitt-Robins, Inc., 157 Chambers St., New York 7, N. Y. The RoBINtronic level indicator consists of an electronic unit and a simple probe unit. The probe unit broadcasts high-frequency current into the space surrounding it. This current—when flowing through free air or gas—causes a bridge circuit to remain in balance. As long as operating conditions remain unchanged, a relay in the electronic unit is held energized. Appropriate lights or other signals can indicate this condition.

When a change occurs in the atmosphere surrounding the probe unit, due to the presence of any material such as stone, the balance of the bridge circuit is disturbed, and the amplifier in the electronic unit functions to release the relay. This will cause the indicating signals to operate. Through the use of a power relay contact, motors can start or stop to control the flow of the material.

For installation, the electronic unit is connected to a power source and mounted at a convenient spot. Cable from the electronic unit to the probe unit is passed through pipe to which the probe unit is attached and lowered into the bin or chute.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 229.

Book on Soil Mechanics

The new second edition of "The Mechanics of Engineering Soils" explains the basic principles of soil mechanics and includes all the recent developments in the field. The more usual tests, together with practical applications of the subject, are described. Included in the volume are chapters on a historical survey, classification of soils, shearing resistance, earth pressure, stability and settlement of foundations, roads and runways, and drainage problems.

Making the book valuable as a reference source are the sets of tables and graphs which provide numerical data. Copies of the book, selling at $6.50, may be obtained from the McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y.

Device Rapidly Measures In-Place Soil Density

A NEW DEVICE that enables a field engineer to determine accurately the in-place density of soils in a matter of minutes was announced at the 33rd Annual Meeting of the Highway Research Board in Washington, D. C.

The cylinder and piston unit, called the Washington Densometer, determines the volume of a test hole by measuring the amount of fluid required to fill a baloon placed in the test hole. Volumes in cubic feet are read rapidly from a calibrated piston rod. By using rings of known volume, holes up to half a cubic foot can be measured.

The device was developed by H. W. Humphres, senior materials engineer, and C. E. Minor, materials and research engineer, both of the Washington State Highway Commission.

In-place density of soil can be measured rapidly with this Washington Densometer. The balloon section, placed in the hole and filled with fluid, permits volumes in cubic feet to be read on a calibrated piston rod.

Existing methods of measuring in-place density of both soils and granular bases have many disadvantages. The primary trouble, of course, is the time required to make the test and analyze the results. On many projects, especially where equipment-train methods are used, much of the work is completed before the test results are available. This often necessitates excessive rolling or, in some cases, the complete reprocessing of a finished section.

In addition, the standard test can be made only on a small range of hole sizes for which the apparatus is calibrated. These tests do not provide for rough surfaces and are affected considerably by vibration, humidity, and temperature. Also, the existing methods require frequent recalibration, are not suitable in clean granular materials, will not permit checking of successive lifts by deepening the hole, and require lengthy calculations.

The Washington Densometer practically eliminates these problems. Wet densities can be determined in 10 to 20 minutes, with only 3 minutes of this time required for setting up and reading the device. An initial reading accounts for roughness of the ground surface. The thin-membrane balloon can be lowered into a hole up to 22 inches deep without any error from trapped air in the wall voids. Other advantages are its accuracy, permanent calibration, speed, and portability.

Operation

The apparatus consists of a circular metal template, calibrated cylindrical rings, a head piece which clamps to the rings, and the cylinder and piston.

When a testing site has been selected, the ground is leveled to provide a solid seat for the template. The open area in the center of the template is not disturbed. Calibrated rings are then placed on the template. The head piece, balloon, and flexible suction tube are attached to the bottom of the 4-foot cylinder and piston. This assembly is set on the rings and clamped to the template.

Two men stand on the template to give it rigidity, then they open the

Volume of test hole determined with balloon inflated by closed system of fluid

main valve and apply a gentle downpressure on the calibrated rod. This forces fluid from the balloon into the rings and head until a definite shock is felt. The procedure is repeated twice, and the reading in cubic feet is shown on the rod. This initial reading gives the volume enclosed from the ground surface to the head.

The fluid is then drawn out of the rings and head as the piston is lifted, and the Densometer and calibrated rings are removed. Being careful not to move the template, the field man digs the hole in the center placing all material in a sealed can. When the hole is completed, a number of rings roughly corresponding to the volume of the hole are removed. Then the Densometer is clamped again to the template. Once again the rod is pressed down, and the hole and head are filled with fluid until a shock is felt.

This final reading gives the volume of the hole and the head apparatus. The known volume of the rings which have been removed is then added to the final reading. This total is reduced by the amount of the initial reading, and the result is the volume of the hole.

The key to this method is the initial reading, which eliminates any error caused by a rough ground surface.

The wet density is computed by dividing the weight of the wet coil by the volume of the hole.

In actual field use, the Washington Densometer has been much faster, equally or more accurate, and considerably more versatile than other methods. THE END

From a paper by Carl E. Minor and Herbert W. Humphres, presented at the 33rd annual meeting of the Highway Research Board, Washington, D. C.

Line of Dragline Buckets

■ A new line of dragline buckets is shown in literature from the Yaun Mfg. Co., Inc., P. O. Box 1508, Baton Rouge, La. The Yaun dragline buckets are manufactured in shell, basket, and perforated models. Each model is built in three weight capacities.

The difference between the perforated bucket and the basket bucket is that the basket type has square holes measuring 4½ x 4½ inches. The perforated type has 1½ x 2-inch round holes. All three types are equipped with the same kind of fittings.

Heavier plate, runners, wearing strips, and other heavier materials are used in the manufacture of the medium and heavy-duty buckets. The heavy-duty bucket is also equipped with more wearing plates. Each type of bucket has 4 to 5 runners, depending on its size, to reinforce the bottom and the back.

All buckets are equipped with manganese-steel fittings. The dump block, the dump trunnion pins, the pull trunnion shackles and all other fittings are manganese steel and are easily replaced. The cutting edge is hard surfaced, as are all wearing corners on the medium and heavy-duty buckets. All buckets have 4 or 5 manganese-steel teeth and bases, depending on their size. The reversible teeth are held in place by tapered pins which are driven in by hammer and then spread on the end to prevent backing out. The buckets are manufactured in sizes from ⅜ to 30 cubic yards. Specifications for buckets to 4 cubic yards are listed.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 247.

Engine Institute Elects

J. E. Heuser, engine division sales manager of the Le Roi Co., a subsidiary of the Westinghouse Air Brake Co., Milwaukee, Wis., heads new officers of the Internal Combustion Engine Institute elected at its annual meeting.

Others elected include: vice president, B. G. VanZee, chief engineer, Minneapolis-Moline Co., Minneapolis, Minn.; and secretary, H. W. Smith, engine division consulting engineer, Caterpillar Tractor Co., Peoria, Ill. The treasurer is J. D. Cook, secretary-treasurer of the Hercules Motor Corp., Canton, Ohio.

New Routing Machine Chips Off Concrete For Retopping Work

■ A 25-hp concrete-routing machine that chips off up to 1¼ inches of 6,000-pound concrete in preparation for retopping has been developed by the G. H. Tennant Co., 2566 N. Second St., Minneapolis 11, Minn. The machine removes the concrete quickly and assures a good bonding surface for the new concrete topping.

The high-speed routing action is provided by hardened alloy-steel cutters that are 4¾ inches in diameter and are mounted on a heavy cylindrical drum revolving at 1,600 rpm. The cutters are loosely mounted and have a powerful lateral chipping action. This is said to eliminate the danger of damaging buried reinforcing rods and loosening imbedded aggregate stones.

The recently announced Tennant 25-hp concrete-routing machine levels a concrete floor in preparation for retopping.

Specially designed for use in cases where damaged or crumbling concrete must be removed before the new surface is poured, the machine routs out a strip 4 inches wide and can cover an area in excess of 75 square feet in an hour. Two men operate the machine, guiding it from front and rear. An adjustable third wheel controls the depth of the cut.

Interchangeable cutting heads adapt the router to many other jobs such as removal of extruded material, pavement joint cleaning, routing out cracks for resealing, scoring concrete to aid traction, leveling humps, and erasing painted traffic lines. Spacing of cutters permits easy adjustment for cleaning or routing any joint from ⅜ to 4 inches wide. These cutters are quickly changed or replaced in the field.

The machine is powered by a 25-hp 4-cylinder V-type Wisconsin air-cooled engine. The body is constructed of welded ¼-inch steel plate. A triple V-belt drive assures smooth delivery of power to the cutting head. Standard equipment includes a push-button self-starter, a 6-volt auto-type battery, a generator, an ammeter, a magneto, and an ignition switch.

For further information write to the company, or use the Request Card at page 18. Circle No. 289.

Line of Truck Shovels

■ Its line of truck shovels is described in new literature from the "Quick-Way" Truck Shovel Co., 4150 Josephine St., Denver, Colo. The line includes models with ⅓, ¼, ⅜, and ½-cubic-yard shovels, convertible to 3, 5, 7½, and 10-ton cranes.

The chief feature described is the versatility of the truck-mounted shovels. They are convertible on the job to trench hoe, crane, dragline, clamshell, pile driver, or back-filler blade. Other attachments are also offered for special work.

The units are built for high speeds between jobs and can travel up to 50 mph on the highway, according to the literature. Also, fast rotating speeds increase working capacity.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 249.

This Sawyer contractors' three-quarter coat is made by a multiple-coating process.

Protective Clothing Of Coated Fabrics

■ A line of protective and safety clothing made of coated fabrics is offered by H. M. Sawyer & Son Co., 20 Thorndike St., Cambridge 41, Mass. The Frog Brand clothing is manufactured through a multiple-coating process whereby the base fabric of the clothing is built into the coating. The garments are guaranteed never to peel, not to become sticky, and not to stiffen in cold weather or soften in warm weather. The company's neoprene Latex clothing is also mildew-proof. Because it is coated on the inside as well as on the outside and through the fabric, any inside dampness will dry in a few minutes. Washing in practically any petroleum solvent will clean the clothing.

The company also offers on these garments an exclusive Stayon stencil with identification lettering such as company insignia. These markings are built into the garment and cannot be removed without cutting out the piece.

A consulting service maintained by the manufacturer deals with particular problems the customer may have and helps in the design of special garments.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 286.

Alloy-Steel Cutting Edge For Dozers and Scrapers

■ A bulletin on a special alloy-steel cutting edge for bulldozers and scrapers has been released by the Shunk Mfg. Co., Bucyrus, Ohio. The company also manufactures scraper, bulldozer, maintainer, snowplow and other blades.

The Rhino blade is precision-machined and rolled to exact specifications. The literature stresses that the blade's construction will reduce downtime caused by the need for blade replacement. Stocks of the blades are on hand in all popular sizes.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 266.

Screw-Anchor Fitting For Earth Augers

■ A new power-driven screw-anchor tool has been announced. The Pengo screw anchor tool is now in production by the Petersen Engineering Co., 460 Kifer Road, Santa Clara, Calif. It is designed to slip over the pilot of any size Pengo auger used on any make of heavy-duty earth-boring machine. The eye of all leading makes of screw anchors or swamp anchors will slip into the other end of the fitting, permitting any size anchor to be screwed into the ground in the space of a minute or two, a quick easy operation.

The new Pengo screw anchor tool holds all leading makes of screw anchors.

It is pointed out that it is not necessary to remove the auger and that there is nothing to remove from the boring machine. The fitting is small and light and can be placed over the pilot bit with one hand. When the anchor is screwed in, the tool slips off the pilot and is carried on the truck until it is needed again.

A similar tool is also in production for use on Tel-E-Lect and other makes of A-frame-type diggers.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 233.

A battery of Ingersoll-Rand wagon drills, powered by I-R 600-cfm Gyro-Flo compressors, drills blast holes for rock excavation at the plant site. *C&E Staff Photos*

Processing Plant Is Built for Taconite Development

1,750,000 cubic yards of rock is excavated for new facility; concrete pouring operations continue through freezing weather

By RALPH MONSON

THE KEY UNIT in the $160,000,000 construction program now under way on the north shore of Lake Superior near East Beaver Bay is the large plant of the E. W. Davis Works of Reserve Mining Co., which will produce blast furnace feed from taconite in Minnesota. The first unit of the plant, scheduled for completion late in 1955, will have a capacity of 2,500,000 tons of iron-ore pellets per year. The 1½-unit plant is expected to be ready by 1957 and will be able to produce 3,750,000 tons of material per year.

Together with this processing plant, Reserve is opening a large taconite mine at Babbitt, town sites at Babbitt and near East Beaver Bay (see "Facilities Are Built for New Communities", C. & E., March, 1954, pg. 94), a 47-mile interdepartmental railroad from Babbitt to East Beaver Bay (see "Iron-Bearing Taconite Sets Off Construction Boom", C. & E., Feb., 1954, pg. 46), and a dock and harbor on the rugged shore of Lake Superior.

The principal plant units will be housed in several large buildings. The concentrator building measures approximately 1,575 x 200 feet; the pelletizing plant is about 1,400 x 185 feet; a storehouse and diesel repair shop measures 200 x 160 feet; and the powerhouse is about 200 feet square. These buildings have concrete footings, structural steel frames, and insulated metal exteriors.

Containing two 500-barrel cement storage tanks and a 150-ton aggregate storage bin, this Noble batch plant supplies concrete for all construction around Beaver Bay. Barber-Greene belt conveyors handle the aggregates.

At the highest elevation at the north edge of the site are railroad yards and unloading facilities for ore-dumping cars. Reinforced-concrete silos serve as surge bins between the unloading facilities and the first plant unit, which is a secondary crusher. From this crusher, belt conveyors will carry the ore through a tunnel under the highway to a bank of storage silos adjacent to the concentrator building.

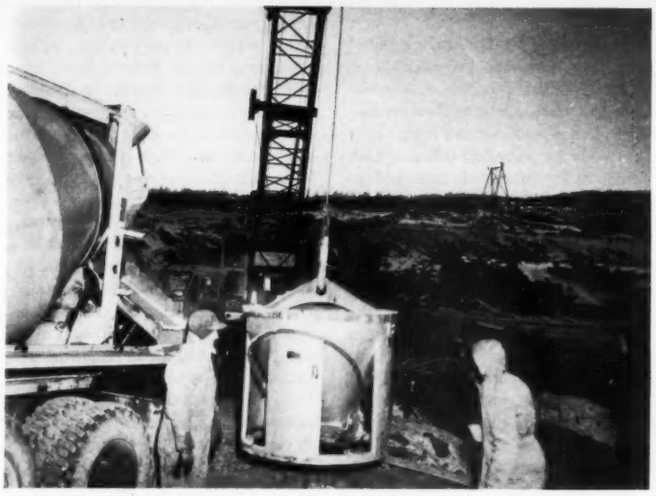
A major part of ore transportation throughout the plant will be handled by belt conveyors. One conveyor system will take the finished pellets to stockpiles, while another system will recover the material and unload it into ore boats for shipment to ports on Lake Erie and Lake Michigan.

Work on this gigantic project is being done by three contracting firms: Hunkin-Conkey Construction Co., Cleveland, Ohio; Arundel Corp., Baltimore, Md.; and L. E. Dixon Co., San Gabriel, Calif. The three firms have undertaken the joint venture under the name Hunkin-Arundel-Dixon.

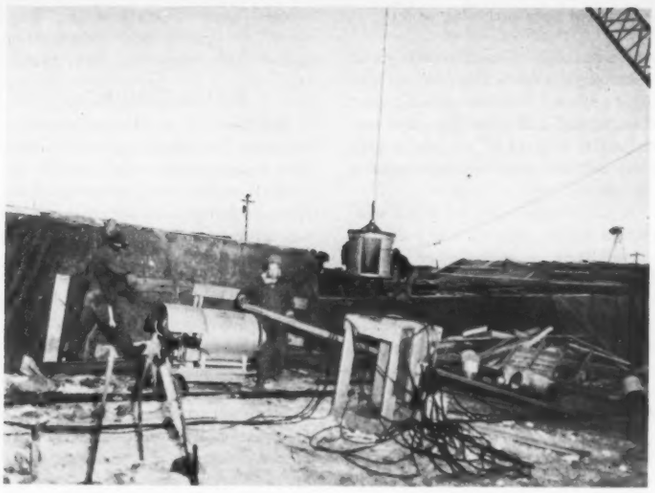
Excavation for the Plant

The plant site of the E. W. Davis Works, lying on a rock hillside which overlooks Lake Superior, runs approximately 3 miles along the shore of the lake. Present construction is concentrated in about one-third of this area. For the most part, the site is a narrow strip, averaging about a quarter of a mile in width, lying be-

An opening is made in the canvas which protects a pour from the cold, permitting a P&H crane with Gar-Bro 1-yard bucket to place concrete.



Working in zero weather, a Worthington 4½-cubic-yard mixer delivers concrete to a Gar-Bro bucket which is handled by a P&H crane. Concrete is placed at 70 degrees F.



Warm concrete is kept covered after it is placed. Silent Glow electric heaters keep inside temperatures above freezing even though the mercury outside dipped below zero.

tween the lake and U. S. 61, the scenic north shore drive.

The slope of the rugged hillside within this area can be seen in the elevations. The railroad yard lies at elevation 867, while about a quarter of a mile away the dock on the shore of Lake Superior is at elevation 608—259 feet below the railroad yard. The lake level is about 6 feet below the dock.

Between these two elevations, a series of benches was cut out of the solid rock of the hillside to accommodate the plant structures and material storage areas. In grading these benches, the contractor excavated nearly 1,750,000 cubic yards of solid granite and Duluth gabbro rock. This material was used to build breakwaters and dock structures and to grade the plant site.

Batteries of wagon drills made the 1¾-inch blast holes 15 to 20 feet deep on an average, although some holes went as deep as 30 feet. Some 50 wagon drills were supplied with air by approximately 20 Ingersoll-Rand Gyro-Flo and Chicago Pneumatic compressors which ranged in size from 350 to 600 cfm. Drill bits were tungsten-carbide tipped.

Drilling operations were carried on by both day and night shifts. Holes were loaded with Du Pont Gelex No. 1 60 per cent dynamite in charges varying with rock conditions. During the break between shifts in the afternoon, when practically all of the workmen were off the site, the day's blast was detonated. The maximum shot at any one time was 7 tons of dynamite.

Loading and hauling the rock was done by large shovels and trucks. One setup which attracted most attention consisted of a Lima Model 2400 shovel and a fleet of 30-ton Mack trucks. Most of the rock passed through the 6-cubic-yard bucket of the big Lima loading the 22-yard boxes of the trucks. Pieces too large to pass through the bucket were balanced on the teeth and tipped off into the trucks. One of the Macks, equipped with a flat-bed dump body, was used to haul single pieces of rock too large to be handled in the regular dump boxes. These pieces weighed up to 30 tons and

(Continued on next page)

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measured as much as 20 cubic yards.

Among the other rigs loading rock were two Northwest 2½-yard shovels and a Marion 3½-yard machine. A fleet of end-dump Euclids hauled from these shovels most of the time.

A sizable quantity of earth consisting of clay, gravel, and rock was moved from one of the lower benches to a low spot near the lakeshore by a fleet of Caterpillar D8 tractors and Wooldridge scrapers. With one D8 and dozer leveling the fill and another push-loading the scrapers, this operation proceeded quickly and smoothly.

Practically all of the excavation, both rock and earth, was completed during the 1952 and 1953 construction seasons. By the end of the 1953 season, most of the building areas were to grade and construction started on some of the structures.

Building Construction

The first job was the construction of camp buildings and field offices. The construction camp lies at the easterly end of the project on a level area of high ground which overlooks Lake Superior and the plant site. A group of 2-story frame buildings house workmen's dormitories, staff dormitory, kitchen, dining hall, recreation hall, storehouses, and offices for contractors' and owner's staff.

Nearby is a temporary power house, set up to supply the camp, construction site, and town site with electrical energy until the permanent power plant can be completed. Storage and repair shops to take care of the contractors' equipment are also located near the camp.

Among the first buildings erected on the plant site was the storehouse. Concrete footings on the rock serve to support the structural steel framework of this building. Its frame carries two large traveling cranes which handle heavy materials and equipment. This building is used to store machines and equipment for the processing plant as they are delivered to the project.

During the 1953 season, the reinforced-concrete silos which are the surge bins for the secondary crusher were erected. Construction of these bins, 46 feet in diameter and 100 feet high, was sublet to MacDonald Engineering Co., Chicago, Ill. Job-built wood slip forms were raised by ratchet jacks on steel rods, allowing the bins to be poured in 9 days of continuous operation. Concrete was delivered to the site in truck-mixers, hoisted to the working platform by a tower hoist, and wheeled to the forms in buggies. Exposed areas were sprayed as soon as possible with membrane curing compound so that they retained water for curing. A large number of additional bins of this type will be located adjacent to the concentrator building during the current season.

Another structure started late in the 1953 season was the powerhouse. Concrete . substructure and basement walls were poured during the early winter even as temperatures occasionally went down below zero. Concrete was delivered in truck-mixers and hoisted to the forms in 1-yard Gar-Bro bottom-dump buckets by one of the cranes.

The entire structure being poured was housed with canvas. Openings

in the housing permitted pouring directly into the top of the forms. As soon as pouring was complete, the openings were closed. Silent Glow electric heaters maintained the inside temperature well above freezing even though outside temperatures fell below zero.

Concrete Plant

To produce the 150,000 cubic yards of concrete required for the plant, docks, town site, and other projects, H-A-D set up a Noble batch plant at one edge of the plant site. The batch plant is served by the plant railroad which delivers carloads of aggregate and bulk cement.

Universal and Huron cements from Mills in Duluth, Minn., and Superior, Wis., are received in bottom-dumping hopper cars. From the hopper beneath the track, a screw conveyor carries the cement to an elevator which feeds it to a 500-barrel elevated silo. Overflow is stored in another 500-barrel silo at ground level. During early construction stages, when the railroad to the plant site had not yet been completed, sack cement was delivered by truck and fed into the plant by hand.

Aggregates consisting of washed gravel and sand are produced by Hallett Construction Co., Crosby, Minn., from a pit at Brimson, Minn., a station on the D. M. & I. R. about 30 miles from Beaver Bay. Bottom-dump ore cars deliver the aggregates to the plant. Two Barber-Greene stacking conveyors pick up the aggregates from hoppers under the tracks and elevate them to the stockpiles. The sand conveyor is 133 feet long and the rock conveyor about 10 feet shorter. Both are 24-inch belts, and their discharge ends are about 40 feet above track grade.

Under the stockpiles is a concrete tunnel 6 feet high, 8 feet wide, and 140 feet long. Hand-operated gates in the roof of the tunnel permit the aggregates to flow down from the stockpiles onto a 30-inch conveyor belt which delivers the material to an inclined conveyor at the end of the tunnel. The inclined conveyor is 166 feet long and slopes at an angle of 35 degrees, with the horizontal terminating at the aggregate bins of the batch plant.

The 24-inch belt of this conveyor delivers aggregates at the rate of 4 tons per minute to the 4-compartment, 150-ton plant hopper. A hand-controlled discharge chute at the end of the conveyor distributes the material to the several compartments. Gates which regulate the flow of aggregates to the scale hopper are manually controlled, but the cement screw is controlled by an electric-eye device. This device shuts off the screw conveyor when the scale beam indicates that the proper amount of cement has been fed into the hopper.

Remote-controlled air-operated gates discharge the materials from the 2-cubic-yard scale hopper directly into the truck mixers. Four Worthington 4½-cubic-yard truck-mixers mounted on International R-190 trucks mix the concrete and deliver it to all parts of the project. Hauls range up to 2 miles for pours in the town site area.

This plant was set up to produce 500 cubic yards of concrete in an 8-hour day, but there have been rela-

tively few days when this amount was required. Normally a crew of five men operates the entire plant, even to unloading cement and aggregates.

Since concrete pouring operations are carried on even when temperatures drop below freezing, it is necessary to provide for heating the mix. A grid of perforated steam pipes under the aggregate piles discharge live steam into the sand and gravel. In addition, heat is supplied by steam coils around the aggregate bins, and jets inside the bins also introduce live steam into the material. Mixing water, stored in a 750-gallon tank, is heated by the introduction of live steam. A Cleaver-Brooks 60-hp oil-fired boiler provides the steam for these operations as well as for steaming frozen aggregate cars.

Near the batch plant, a field testing laboratory has been set up to make regular tests of the concrete. Cylinders are made from each day's pour, cured in a water bath, and tested in a hydraulic compression tester capable of exerting a load of 200,000 pounds.

The normal 5½-bag mix contains the following weights of materials:

Cement	517 lbs.
Sand	1,274 lbs.
Gravel (1½-in. max.)	2,055 lbs.
Pozzolith	½ lb. per sack
Water	4.75 gallons per sack

Erection of steel superstructures for the buildings will be done this season, and the installation of equipment is scheduled to start as soon as buildings can be completed.

Personnel

E. C. Lampman is manager of construction for Reserve Mining Co., with H. F. Gosnell in direct charge of the work on the E. W. Davis plant area. Larry Edwards is in charge of administration.

Project manager for Hunkin-Arundel-Dixon is V. F. Robertson. J. R. Riggs is general superintendent of the Beaver Bay area; Paul R. Smith is assistant project manager; and D. J. Leitch is office manager.

THE END

New Electric Plant For Transit-Mixers

■ A new hand-portable engine-driven electric generator plant is offered by the Lynn Engineering & Supply Co., Russ Building, San Francisco 4, Calif. The unit will operate electric power tools, floodlights, radio and communications equipment, air compressors, and water pumps, whether driven by electric motors or belts. It is also supplied as a package unit with an air compressor and large electric impact wrench for use by tire service-fleet operators.

The Model B-2000 Lynnco Powerhouse provides both electrical and mechanical power simultaneously without the necessity of removing either the generator or engine from the steel base. This is accomplished by attaching a sheave and V-belt to the extended engine crankshaft and connecting this to any belt-driven equipment.

The plant is designed with a small-diameter alternator tucked under the engine gas tank and fastened ridgidly to the engine crankcase with studs. This arrangement adds only 4½ inches to the over-all width of the standard engine and results in compactness, accessibility, and portability. The unit can be carried by one man and readily fits in the standard automobile truck.

The maximum output is 2,500 watts. The plant has a continuous rating of 2,000 watts, with the single phase 60-cycle generator operating on 115 volts. Over-all dimensions are only 17 x 23 x 19½ inches. The weight is about 145 pounds complete.

The Model B-2000 Lynnco Powerhouse electric plant.

Power is supplied by a 5-hp Briggs & Stratton 4-cycle air-cooled engine operating at 3,000 rpm. The generator is driven at 3,600 rpm by a steel-cable cog-type V-belt.

For further information write to the company, or use the Request Card at page 18. Circle No. 288.

Portable Hoisting Tower Is Self-Erecting Unit

■ A self-erecting hoisting machine that is trailer mounted for portability is illustrated in literature from the Buck Equipment Corp., 205 Butler St., Cincinnati 2, Ohio. The Buck hoisting machine has a two-wheelbarrow-size platform that is removable and may be replaced with a self-dumping concrete bucket.

The tower erects to a 40-foot unloading height and additional tower sections in 5 and 10-foot lengths are available. The top section folds out and then two top sections are pulled from the horizontal to the vertical position by a power-driven erecting mechanism. This mechanism uses the entire weight of the machine which, tied in with the running gear, lowers the machine until the base frame is flush with the ground. The unit is easily towed by a pick up truck.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 251.

This new Autocar diesel tractor is shorter than regular models but comes with engines rated up to 200 hp. It permits longer trailers of greater payload.

Shorten Diesel Tractor To Meet Highway Limits

■ A shortened diesel tractor that pulls longer trailers and still stays within the generally used 45-foot maximum length is announced by the Autocar Division of the White Motor Co., Ardmore, Pa. The Model DCU-75TN is a snub-nosed version of the standard diesel tractor. One end of the diesel engine comes back through the cowl of the cab and is covered with an insulated metal casing that is easily removed for maintenance.

The conventional Autocar diesel's length is 123 inches from the front bumper to the back of the cab, while the new shortened tractor reduces this length to 106 inches. The 142-inch wheelbase on the conventional model is reduced by 11 inches to 131 inches. This gives the vehicle greater maneuverability. The new model comes equipped with diesel engines rated up to 200 hp.

For further information write to the company, or use the Request Card at page 18. Circle No. 210.

Column Clamps and Shores

■ Literature describing column clamps, screw-jack shores, and C-clamps is available from the Dayton Sure Grip & Shore Co., Miamisburg, Ohio. The Dayton Sure Grip column clamps consist of two identical units, adjustable to a fraction of an inch. Adjustment of the clamp squares the column. The unit is available in 36 and 48-inch sizes and comes with malleable iron corner brackets, with wedges chained and riveted to the brackets.

The screw-jack shores shown are made in lengths adjustable from 5 to 9 feet, 7 to 13 feet, and 8 to 14 feet. They are guaranteed for a working load of 3,000 pounds. The lightweight shores feature positive pin and screw-jack adjustment, eliminating the possibility of slipping under load.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 230.

Warner & Swasey News

Warner & Swasey Co., of Cleveland, Ohio, has announced four sales appointments in its expanding Gradall Division. Herman Kraus is new district manager of a five-state southwestern territory with headquarters at Houston, Texas. Joseph K. Moran has been named district manager of the eastern office with headquarters at East Orange, N. J.

Shelby Coffman and Robert Bechtel have been assigned to new sales duties on the Pacific coast. They will cover eight western states, working out of Los Angeles.

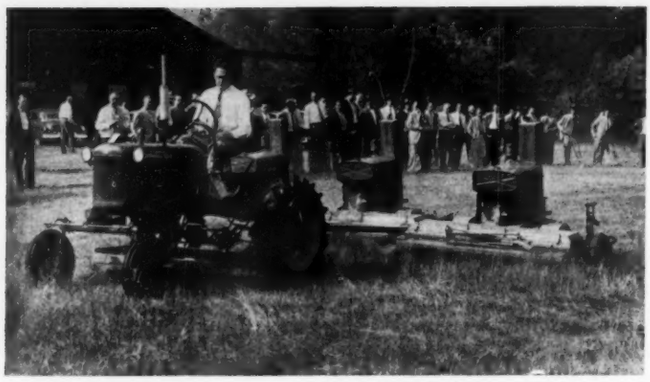
Data on Excavator-Crane

■ A ½-yard truck-mounted excavator crane is described in literature from the Wayne Crane Division, American Steel Dredge Co., Inc., 2000 Taylor St., Fort Wayne 1, Ind. The Model 40 has a 12½-ton lifting capacity and is convertible to crane, dragline, clamshell, and trench-hoe operation.

A section of the booklet is devoted to relating construction features of the excavator crane to job requirements. For example, it is shown that the machine has stability with outriggers even with a 70-foot boom. A photograph of the unit working in close quarters indicates the importance of mechanical clutches that let the operator feel the load for positive control.

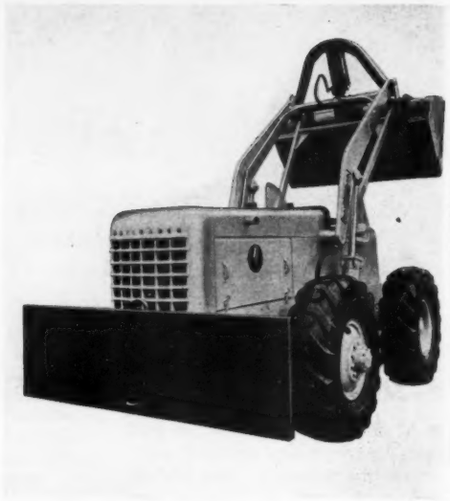
A second section gives details on the construction of the components of this machine. This portion discusses the oversize 20-inch clutches, the steel cab, the direct power-flow transmission, and the hydraulically operated boom hoist, among other things. A wide selection of gasoline or diesel engines is available for powering the unit. Complete specifications are included.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 255.



The new three-gang rotary Blitzer, manufactured by the Worthington Mower Co., Stroudsburg, Pa., demonstrates its ability to cut overgrown areas of an airfield. Each unit is independently driven by a 13.3-hp four-cycle gasoline engine. The machine, easily pulled by a light tractor, cuts a 17-foot swath at a mowing speed of 5 mph. For further information write to the company, or use the Request Card at page 18. Circle No. 211.

The Model HM Payloader with new pusher plate.



Tractor-Shovel Unit Gets New Accessories

■ Two pieces of accessory equipment to increase the usefulness of its Model HM four-wheel-drive Payloader tractor-shovel have been announced by the Frank G. Hough Co., 762 Seventh St., Libertyville, Ill.

One is a wide pusher plate of heavy rolled steel for rear-mounting so that the machine can push stalled trucks and other equipment and spot railroad cars. This pusher plate also includes a retractable towing link, so that the 1½-cubic-yard tractor-shovel can tow, haul, or skid loads.

Where it is desirable to use the Model HM as a prime mover to haul hydraulic - controlled scrapers, wagons, and rooters, a set of hydraulic connections and valves can be installed for control of the hauled equipment.

For further information write to the company, or use the Request Card at page 18. Circle No. 311.

Parts For Abrasive Use Made of New Alloy

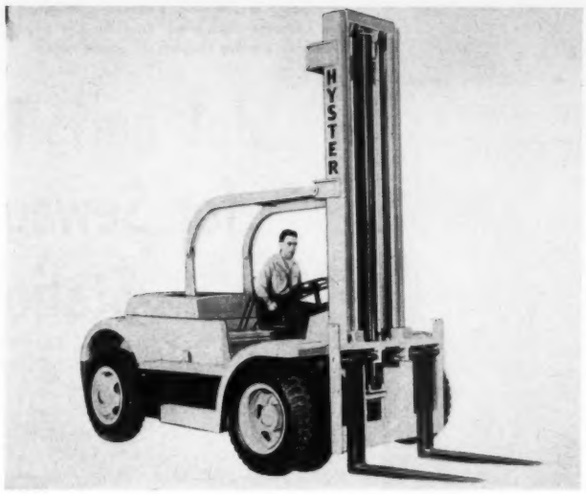
■ Pugmill paddles, conveyor rollers, mixer blades, and other parts with relatively short service life due to the abrasive wearing action of sand, gravel, and cement are said to get a longer lease on life when they are cast from a new wear-hardening chrome-ferrous alloy. ZeVeScal Series W has been developed by the Calumet Steel Castings Corp., 1636 Summer St., Hammond, Ind.

Parts cast from this alloy are said to outwear identical parts cast in commonly used special wear-resisting alloys. In addition to the advantage of lower parts replacement and labor costs, the new alloy reduces equipment downtime.

For further information write to the company, or use the Request Card at page 18. Circle No. 281.

Heil Sales Manager Named

Roland Karste has been appointed district sales manager of The Heil Co.'s Detroit district office, which handles national account and distributor sales of Heil truck bodies and hydraulic hoists in all of Michigan except for one section that is covered by the home office in Milwaukee. Mr. Karste was formerly a Heil representative in Chicago.



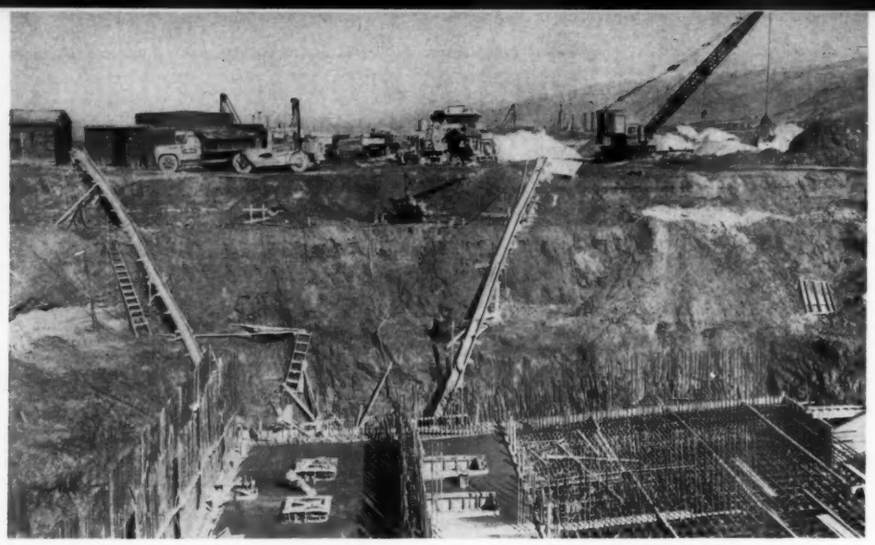
A feature of the new Hyster Model RC-150 is short over-all length.

Lift Truck Features Maneuverability

■ A new 15,000-pound-capacity lift truck has been announced by the Hyster Co., 2902 N. E. Clackamas St., Portland 8, Oreg. The Model RC-150 lift truck, mounted on 8:25 x 20 pneumatic tires, is powered by a heavy-duty water-cooled industrial engine. According to the manufacturer, the truck has the shortest over-all length and narrowest width in its field.

The underclearance is said to allow the unit to travel safely over rough surfaces and inclines. Other noteworthy features are a high degree of visibility, fully roller-mounted uprights, extreme braking area, and brute-type body construction. The lift truck is also available in capacities of 16,000 and 18,000 pounds at 24-inch load centers.

For further information write to the company, or use the Request Card at page 18. Circle No. 312.



A pour setup in the early stages of foundation work. Heavy concrete slabs were used for the plant base and walls to prevent seepage of ground water.

Tough D for Sewage Station

CONSTRUCTION of a $594,000 sewage pumping station in the boggy bottom land of Great Salt Lake is the first step in a program being undertaken to correct Salt Lake City's sewage disposal system. And although the lowland site was expected to present numerous construction problems, preliminary foundation work has been accomplished with a surprising minimum of difficulty.

The city's sewage disposal system has long been a serious problem. For years, sewage has been dumped directly into Great Salt Lake. A stretch near the mouth of the adjacent Jordan River is one of the most polluted streams west of the Mississippi. As a result, the state of Utah has passed an antipollution law to prevent similar situations in other parts of the state.

Last spring, the Salt Lake City Corp., a municipal organization interested in bringing the city's outdated sewage-disposal system up to modern standards, joined with the Clyde C. Kennedy Co., San Francisco consulting engineers, in a study of the problem. A site for the new pumping station was chosen about 9 miles from Great Salt Lake.

Plans called for construction of the station in the old Lake Bonneville bed about 27 feet below the water level of Great Salt Lake. The site lay only 1,000 feet from the Jordan River and 40 feet below its water level. A 41-foot excavation, 160 x 200 feet at the top, was mapped—the deepest man-made excavation in that bottom-land area. Engineers foresaw the possibility of a major cave-in as a result of the necessary dewatering.

Today, however, the excavation and the big concrete slabs for the station's footings are a reality, and the dewatering process was carried out with relatively little difficulty. Davis & Butler Construction Co., Salt Lake City and Provo, Utah, was the contractor.

When completed, the pumping plant will be a heavy reinforced-concrete structure resting on the boggy lake bed. It is designed with

Dewatering Job

Engineers use wellpoint system to eliminate cave-in hazard in constructing a pumping plant 27 feet below lake level

three stories below ground level and one above. There are no bearing piles underneath the base; consequently the building, in a sense, will float. Heavy concrete slabs will be used, including a 1,300-cubic-yard pour with 100 tons of steel reinforcing for the foundation. This base slab is 10 feet thick. Slabs 4½ feet thick rest under approach and discharge channels. Altogether, the project represents a 3,900-cubic-yard concrete job, with about 275 tons of steel reinforcing.

Ground water is not the only difficulty presented by the site. Water coming out the discharge of the pump station will be so saturated with the natural salts of the area that discharge analyses are expected to show 55,000 ppm of sodium chloride.

Rugged Excavation

So much had been said about the difficulties of the excavation job that Davis & Butler decided from the outset to proceed with great caution. Since time was limited before winter rains would set in, operating schedules stood in great danger of being disrupted completely unless the big excavation was dug rapidly and safely.

The John W. Stang Corp., Bell, Calif., was called in before the first earth was turned, and engineers of that organization were asked to make a study to determine if the area could be unwatered. (The Stang firm specializes in such tough problems as this.) The study showed ground water within 7 feet of ground surface.

Formations, moreover, were the kind which complicate the task of unwatering engineers. Boring No. 19, for example, was nearest the pump station site. It showed brown sandy silt to minus 5 feet, white silty clay to 15 feet, blue clay to 20 feet, fine blue sand to 23 feet, blue clay with sand partings to 31 feet, black clay to 32 feet, blue clay with sand partings to 47 feet, and a variety of clays, clay with gravel, clay with peat, and blue clay down to the 90-foot level probed by investigators. These levels are measured from natural ground surface. In many places, the boring tools could be driven by hand, so soft was the formation.

Stang's engineers came up with a suggestion for benching the excavation down in two berms, with a row of Stang wellpoints on each berm. The points were jetted in with the help of a 12-inch jet pipe, and all points were installed on 6-foot centers around the perimeter of the excavation. Each wellpoint was encased in sand filter material before the jet casing was pulled. One set of points was put on a berm at ele-

A P&H crane assists workmen handling steel reinforcing rods for the pumping station. When completed, the plant will have one story above ground level and three below. *Ray Day Photo*

vation 4233, and another went around the perimeter on a berm at elevation 4220. (By comparison, the main operating floor of the plant is at elevation 4247, and natural ground is at approximate elevation 4240.) The wellpoints were hooked with conventional risers and swing joints to headers, and these in turn were hooked to the two Stang vacuum pumps which maintained the suction on the points. Thus ample water-reduction capacity was provided.

The first material was stripped off the excavation block by a Caterpillar D7 tractor and a Caterpillar 12-yard scraper. The main block of excavation was then removed by a P&H dragline with a 1½-yard bucket and a Link-Belt Speeder HC-70 truck-mounted machine with a ¾-yard bucket. Three dump trucks, a Ford and two Internationals, carried the material away for disposal.

Stang wellpoints are jetted into the ground at an early stage of excavation. Note heavy ground water in foreground.

Coincidentally with the dragline work, a steady suction was maintained on the wellpoint system, and the ground surface soon became strong and safe enough for the draglines and trucks. The machines pulled all of the excavation block out from their positions at the top of the bank. To be on the safe side, both rigs worked about 25 feet back of the edge—just in case the big cave-in came from the bottom as the experts had predicted.

Concrete Work Starts

As soon as the excavation chore was finished, Davis & Butler began the construction of concrete work. Carpenter crews had been busy in a central yard with power saws and lumber piles for some time, making all of the intricate training-wall and channel forms. In addition, a supply of rented Economy steel forms had been shipped in from Denver for use in the typical sections where strength and a true dense concrete face was needed.

The concrete mix used was based on 3,000-pound material at 28-day strength, and the basic components included 94 pounds of cement, 190 pounds of sand, and 324 pounds of 1½-inch-minus aggregate. When Utah Portland cement was used, enough Darex air entraining agent was added to produce about 3½ per cent air in the mix. Type II-A Ideal cement, with air entraining agent already added, also was used.

Several pouring schemes were used. On the 1,300-cubic-yard-base pour, a Johnson 4-compartment manual weigh hopper was brought in with sacked cement and two 16-S Kwik-Mix mixers. Early calculations showed that the pour could be completed in about 20 hours. The cement could not be opened and the batches mixed that fast, however, and the pour took 56 hours of sustained

operation. The weather was damp but not rainy, so there was no cold jointing of the concrete.

Pumpcrete was attempted on the next sizable pour, but the lead-in on the lines was necessarily awkward. Truck mixers from Utah Sand & Gravel Products Corp. then mixed the material, and it was chuted down successfully to the placement point. From here on, all the large pours were to be handled by truck mixers from this firm, and the concrete was to be transferred to the forms by a Gar-Bro bucket and the P&H crane. The 16-S mixer setup and the Johnson manual batching plant will be used when the pump station nears the top point, and yardage gets smaller in each pour.

The concrete is being cured by water and, in the case of flat slabs, by wet sand.

When CONTRACTORS AND ENGINEERS visited the project, the main slabs were all in, and men were busy forming the main walls, training channels, and other parts of the superstructure. Both sets of well-points had been removed and a Rex 4-inch centrifugal pump was taking care of water infiltration at the low point of the excavation. Preparations were being made to replace the earth backfill before further caving could occur. There had been some caving, particularly at the top of the hole, but any squeezing action from the bottom of the hole had been prevented.

When the pumping station is completed, it will be connected to the present sewage pumping station in Salt Lake City by a 78-inch concrete pipeline. The present plant, which is capable of handling 50 mgd and does little more than chlorinate the sewage before dumping it into Great Salt Lake, will be enlarged to handle 100 mgd, and a full system of digesters, clarifiers, filters, and sludge beds will be installed.

Field operations for Davis & Butler were supervised by Fred Jackson, general superintendent. City Engineer Roy W. McLeese, former highway engineer for the Utah Road Commission, is chief engineer for the Salt Lake City Corp. Maurice N. McKendrick, resident engineer, and Phil Beck, inspector, are handling on-the-job supervision. THE END

The latest addition to the Challenge line of truck mixers is this 5½-yard unit.

Add New 5½-Yard Unit To Truck-Mixer Line

■ The addition of a new 5½-yard mixer to the Challenge mixer line is announced by Cook Bros. Equipment Co., 3334 San Fernando Road, Los Angeles 65, Calif. With the 5½-yard unit, the Challenge Mfg. Co. now offers seven different sizes of mixers with 3, 3½, 4, 5, 5½, 6, and 6½-yard rated capacities.

For its size, this new 6,300-pound mixer is light in weight. The manufacturer states that the unit legally carries its capacity payload in 38 of the 48 states on the same standard 3-axle truck currently required by many 4½-yard mixers. It is pointed out that this extra 1-yard payload is of particular importance to operators working on large pours and on jobs where larger, heavy-duty trucks are impractical.

For further information write to the company, or use the Request Card at page 18. Circle No. 274.

Large-Capacity Crusher

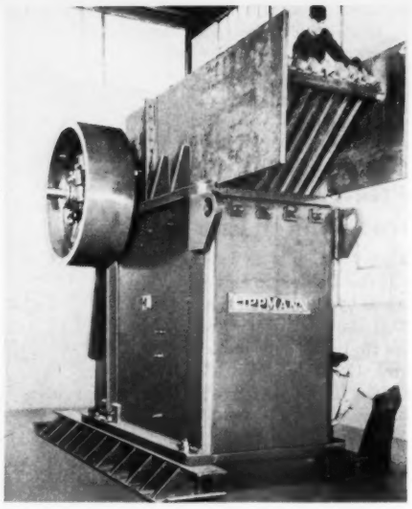
■ The newest addition to its Grizzly-King jaw crusher line was recently announced by the Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis. The new unit is a 42 x 48-inch overhead eccentric crusher and is reported to be the largest of its kind in the world. It has a capacity of over 1,200 tons per hour at the largest setting, and at the 5-inch opening the unit will average about 800 tons per hour.

In addition to its large capacity, this crusher offers the advantage of taking larger rocks, enabling the pit operator to space his blast holes farther apart to save time and materials. The crusher is also said to have excellent control over the product size required and lessens the need for additional secondary processing.

A further feature reported is a well-balanced design that reduces vibration to a minimum for lower maintenance and power requirements. Also eliminated is the need for costly substructures.

The machine is fabricated with laminated metal for extra strength and durability. Including the new crusher, the Grizzly-King line now has units ranging from 12 x 36 up to 42 x 48 inches in size.

For further information write to the company, or use the Request Card at page 18. Circle No. 285.



This 42 x 48-inch jaw crusher is the largest of the Lippmann Grizzly-King line. The hopper and grizzly shown at the top of the crusher are optional equipment.

Booklet on Drainage Pipe And Other Road Products

■ How its complete line of drainage pipe and other road-construction products is used on the nation's express highways is described in a new folder from Armco Drainage & Metal Products, Inc., 703 Curtis St., Middletown, Ohio. Photographs of typical installations are shown and discussed briefly.

Included in the folder is information on standard corrugated pipe, standard pipe-arch, asbestos-bonded pipe and pipe-arch, end sections, multiplate structures, perforated pipe, pipe piling and pile shells, Flex-Beam guardrail, bin-type retaining walls, and Steelox steel-paneled buildings.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 180.

Land-Clearing Rakes

■ Two new heavy-duty rakes have been added to the line of land-clearing equipment made by the Rockland Allied Equipment Corp., Harborside Park, Providence 5, R. I. With the addition of Models RF-1 and RF-2, three basic models and eight tooth designs are now available.

New features include a clear penetration of 18 inches below the main beam and removable tooth shanks for interchanging with alternate-style teeth for boulder removal, brush removal, or scarifying. The change is accomplished by releasing a pull-out pin in each tooth.

The rakes are made for general land-clearing or for specific types of work. They mount on all makes and models of crawler and rubber-tired tractors.

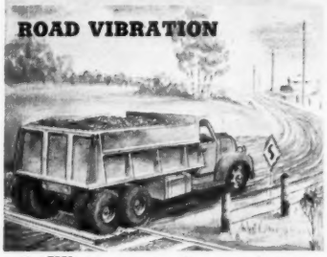
For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 306.

Poor & Co. Director

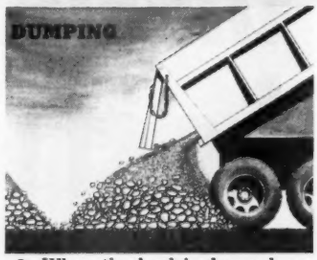
Walter A. Wecker of Chicago, president of the Marquette Cement Manufacturing Co. since 1933, has been elected to the board of directors of Poor & Co., Chicago.

Mr. Wecker is a director of the Portland Cement Association and of the Chicago Association of Commerce and Industry.

HOW GRAVEL SEGREGATION IS CAUSED

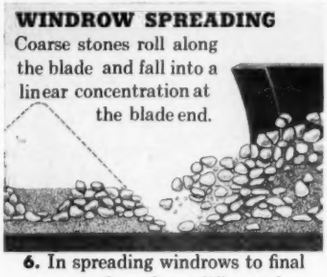


1. When aggregates are transported the bumping and vibration causes the fines (dust, small particles and chips) to sift to the bottom of the load while the larger stone works toward the top and sides.

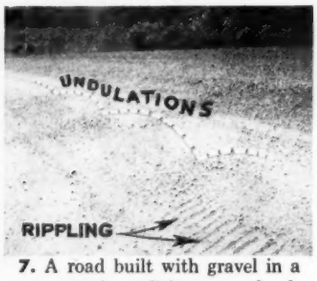


2. When the load is dumped on the roadway, the material forms in piles. The larger stones roll from the truck first, the fines fall last. The segregated condition is now reversed; the coarse aggregates are in the base of the pile.

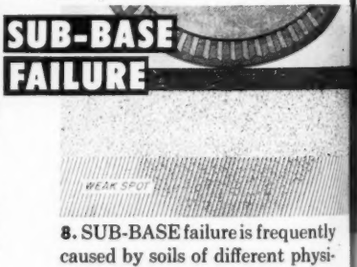
3. When the piles are leveled to specified depth, alternate pockets of fines and coarse are formed. Such segregation is highly unstable and a base course so constructed would soon ravel and break up.



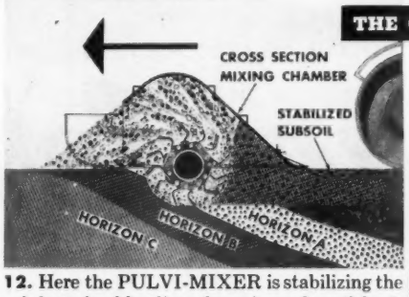
6. In spreading windrows to final crown and grade, a different but very unstable segregation is caused. Fines are found in concentration in the "heart" of the windrow. Some of these remain in a pocket; others sift to the bottom. Stones which are "topped" by the blade, are rolled to the surface.



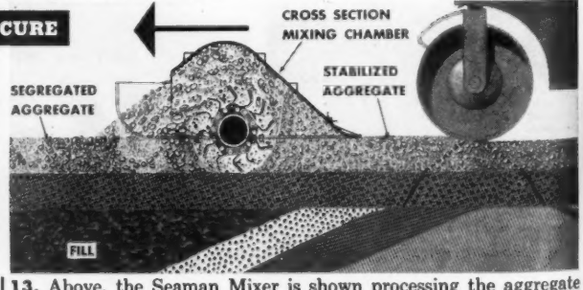
7. A road built with gravel in a segregated condition soon develops rippling, undulations, and a "wash-boardy" condition. Traffic keeps those non-keyed stones in motion. Rain trapped in the hollows seeps through and weakens base and sub-base. Freezing and thawing complete the destruction.



8. SUB-BASE failure is frequently caused by soils of different physical characteristics reacting unevenly to moisture. Here a weak spot is developing just below the base course. This would not occur if sub-base had been processed to blend the soils and eliminate voids.



12. Here the PULVI-MIXER is stabilizing the sub-base by blending the sub-grade soil horizons (A, B, C,) to attain a course which is uniform in moisture, density and thickness. Weak spots such as that shown in the previous four diagrams will not occur and therefore the base will not require maintenance.

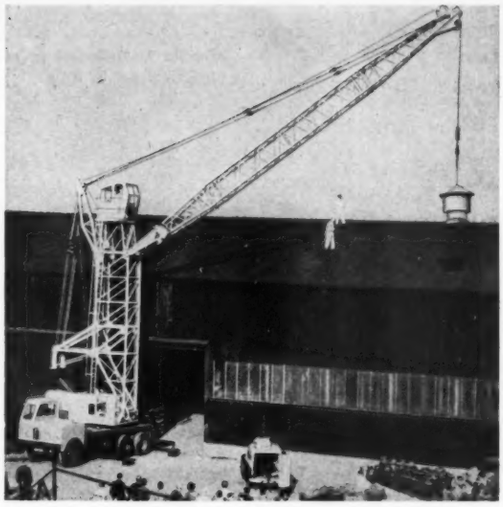


13. Above, the Seaman Mixer is shown processing the aggregate for the base, correcting an always-present segregated condition. The material has previously been shaped to final crown and grade. No further blading is needed, for the PULVI-MIXER not only completes the mix but also leaves it in a partially compacted condition, exactly to the grade established, ready for final rolling. This partial pre-compaction is needed because materials left too fluffy are subject to segregation during compaction.

Mobile Tower Crane Is Convertible Unit

■ A new mobile crane mounted on a rubber-tired carrier is convertible from a tower crane to a strut-boom crane. This machine, the Coles truck-mounted tower crane, has the advantages of the mobile crane, and the added ability to raise and lower its own tower. It can travel long distances at a fraction of the cost involved in moving a static plant. It can operate as a tower crane at certain stages of work and as an ordinary boom crane at other stages.

The new truck-mounted tower crane is electrically operated but generates its own power by means of a gasoline engine, which makes it independent of trailing cables and power points. The crane itself has three main motions—hoist, boom hoist, and slew—each operated by a separate electric motor which in turn is energized from a specially designed generator coupled to the power unit. This system of transmission provides smooth, rapid, and accurate operation and delicate control of loads, Coles reports.



The Coles truck-mounted crane can operate as a tower crane at certain stages of a job and as an ordinary boom crane for other work.

The model shown in the accompanying illustration is fitted with a 60-foot tubular boom which will lift 5 tons at a 24-foot radius to a height of 82 feet 6 inches above ground level. The crane operator, seated 36 feet above ground level, has a full view of the working area. The travel motion of the crane can be operated with the tower erected. For traveling over great distances or under overhead obstructions, the machine can lower its own tower. Full circle swing of the crane superstructure in either direction is a feature. As a normal crane, it will handle a maximum of 23 tons at a 10-foot radius with a 30-foot boom.

For further information write to Coles Cranes, Inc., Box 942-TR, Joliet, Ill., or use the Request Card at page 18. Circle No. 240.

New Lighting Plants

■ Three new models have been added to the group of lighting plants sold by the Katolight Corp., 624 N. Front St., Mankato, Minn. The power units generate standard 60-cycle ac current, the same as that developed by city and country highlines. The generators are of self-excited two-pole design, and are directly attached to the engine crankshaft.

The engine on the 1,350-watt model is a 9FB Briggs & Stratton air-cooled unit. The complete plant weighs 146 pounds and is equipped with rubber-mounted-type isolators, receptacles, and carrying handles. The plant is also available in 650-watt and 2,000-watt models.

The unit's engine will run on kerosene. It may be arranged with a two-compartment tank, starting on gasoline and running on kerosene.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 307.

Hyster Appoints Three

Three sales positions with the Hyster Co., Portland, Oreg., have been filled by the promotion of personnel within the organization. Jack Wright has taken over as district manager in the northwestern district, James N. Rector has become district manager of the southeast territory, and Robert Hile has assumed the duties of general manager at the Hyster retail store in Chicago, Ill.

A Caterpillar dozer pushes up the sides of a firewall to an 8-foot height, while a Terratrac, in rear, knocks off the ridge.

After the firewall is built up, a Caterpillar No. 212 motor grader trims the 1 on 1½ slope. The top of the wall is 3 feet wide.

Multipurpose Rigs Speed Grading Job

Versatile units are adapted to many phases of drainage, pipe work, and firewall construction for project on new oil tank field

"VERSATILITY and mobility are the two factors really making our Gradalls click on this job," says Fred Arnolt, Jr., of North Plainfield, N. J., whose firm, Arnolt Bros., Inc., is doing grading and other earthwork on the site of a new tank field near Bayway, N. J., for Standard Oil Co. of New Jersey. Arnolt's four Gradalls are kept busy doing all kinds of jobs from driving sheet piling to spreading slag covers on the firewalls.

The project calls for the construction of eighteen 150-foot-diameter steel tanks spaced about 300 feet apart and surrounded by built-up earth firewalls. Support for each tank consists of a 170-foot-diameter cone-shaped pad of sand 1 to 5 feet thick.

General contractor on the job is the Kuljian Corp. of Philadelphia, Pa. Arnolt Bros., Inc., and United Excavating Co. of Linden, N. J., have a joint-venture grading subcontract totaling over $500,000. Fred Arnolt, Jr., is superintendent on the job. Major items are 200,000 cubic yards of excavation, about 7 miles of drainage ditches, 3 miles of built-up firewalls, and 75,000 cubic yards of sand fill for the tank pads.

When Arnolt moved in during the fall of 1952, the 50-acre site had already been cleaned, but the ground was very wet. To drain the excess water, several ditches leading to a nearby river were opened up with a Unit backhoe.

Soon after, Arnolt brought in six Caterpillar crawler-scrapers and began moving earth from the high areas and building up the firewalls. The 15-yard units were push loaded with Allis-Chalmers HD-20's and International TD-24's.

In most cases, the firewalls were built up from the bottom, even in areas where the existing ground was higher than the walls. The scrapers dumped the earth in 6-inch lifts as a sheepsfoot roller did the compacting. Hauls averaged only about 300 to 400 feet, and production reached 5,000 yards per 10-hour day.

The trapezoidal firewalls are 8 feet high, 3 feet wide on top, and have sides sloping 1 on 1½. Naturally, this height could not be built up completely by scrapers. To get the proper quantity of material distributed along the strips, the scrapers spread the lifts 27 feet wide, but only 5 feet high. Then a Caterpillar D8 dozer pushed up the sides, a Terratrac tractor knocked off the ridge, and a Caterpillar No. 212 motor grader rode the steep sides trimming the slopes.

Slopes that eroded during the winter were dressed by this Gradall using a 60-inch bucket. The machine also dug the V-type ditches on the outside.

The Gradall bucket grabs a load of slag from the box, swings over to the slope, and spreads a 3-inch cover from the bottom up.

Steel piping for the new Standard Oil tank field near Bayway, N. J., is set by the Gradall. The pulling action of the Gradall's telescopic arm sets the pipe into the coupling.

Most of the firewalls were completed when the job was shut down for the winter. By spring, however, the slopes had eroded badly and a Gradall was moved in to dress them up and also to dig the V-type trenches along the outer sides. Both operations were done with a 60-inch bucket.

Gradall Job

From here on, the work was dominated by Gradalls. Arnolt used the multipurpose rigs for sloping, ditching, digging pipe-support footings, driving timber sheet piling, unloading and hauling pipe, and spreading slag on the firewalls.

Most of the sloping and ditching was done with 60-inch buckets. Footings for the pipe supports were cut neatly with a special trench bucket.

Long lengths of steel pipe were also handled effectively by the Gradalls. Individual pieces were first picked up from a stockpile, pulled in tight against the rear of the machine, and hauled to the site. The pulling action of the telescopic arm was also used to set the pipe into the coupling.

In certain areas the drainage was redesigned, calling for 24-inch concrete pipe to be placed in the already-built V-type trenches. Arnolt found that the standard grading blade rotated at the end of the arm could easily round out the bottom of the ditch to seat the pipe. The pipe was then laid by the Gradall.

Slag Cover

The most unusual Gradall application on the job has been the laying of the slag cover on the firewalls—a phase of the project now going on. Slag was a later development in the contract, and Arnolt did extensive experimenting before he found the right method.

(Until recently, firewall slopes had been stabilized with vegetation, but the oil companies found that the dead grass presented a fire hazard, and many are now switching to slag.)

Bethlehem Steel Co. supplies the 1½-inch slag on the Standard Oil job. It is shipped by rail to Linden, N. J., where it is stockpiled by a clamshell. A Hough Payloader loads five dump trucks from the stockpile. The haul to the tank field is about 3 miles.

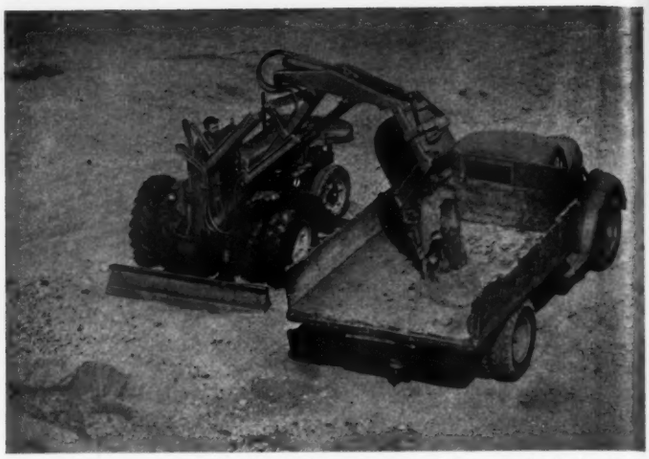
At the field, the trucks dump the slag into a 10 x 10-foot box which is pulled behind the Gradall. Using the 60-inch bucket, the telescopic arm grabs a load of slag from the box, swings over to the wall, and spreads the 3-inch cover, working from the bottom up. Very little follow-up raking is required to level the cover. The slag at the base of the firewall is lined up by 2 x 4 guides. Generally, the Gradall works on the near slope so that the operator can see where he is working. With this system, production averages up to 3,000 square yards in 8 hours.

Tank Pad

Sand for the tank subgrade was trucked in through gaps in the firewalls, dumped, spread with dozers, and compacted with a Bros Wobble Wheel roller. Two 1½-inch courses of bituminous concrete were then laid on the pads with a Barber-Greene finisher and rolled with a Buffalo-Springfield roller. C. H. Winans Co., of Elizabeth, N. J., handled the pavement work.

Fred Arnolt is president and Martin Jessen is vice president of Arnolt Bros., Inc. Louis J. Sisto is president and Robert K. Miller is secretary-treasurer of the United Excavating Co. THE END

The Hydro-Trencher mounted on the Oliver Model 88 wheel tractor in use as a trencher . . .



. . . and here the new Oliver trencher attachment is converted to a swing loader by turning the bucket around.

Hydraulic Trencher For Wheel Tractor Converts to Loader

■ A newly designed hydraulic ½-yard trencher and swing loader combination has been announced for the Oliver Model 88 gasoline or diesel wheel tractor. The new unit, known as the Model 88WT Hydro-Trencher will dig to a depth of 10 feet and load to a height of 10 feet 6 inches. An optional boom cylinder increases the digging depth to 12 feet, and an optional loading bucket with a hydraulically controlled trap door permits loading to 12 feet. The machine will do trenching work and can be converted to an efficient swing loader in a few minutes simply by turning the bucket around. No special tools or additional parts are needed.

The all-hydraulic operation of the machine is valuable in sewer and pipeline operations as well as other trenching tasks. Hydraulic pressure applies down force on the boom for digging through rocky soil, roots, or other stubborn conditions.

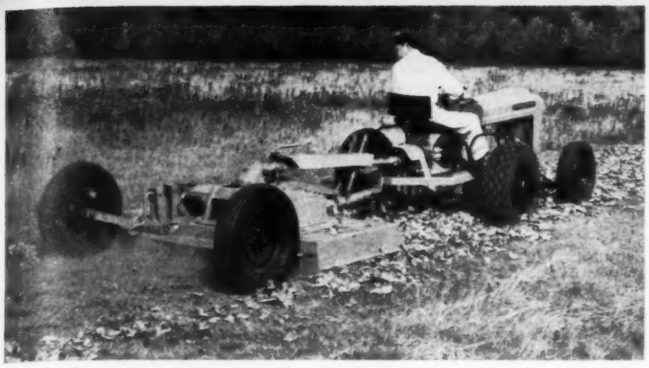
The trenching and loading unit features a dual-circuit control system with two completely separate hydraulic circuits and individual controls. This provides the operator with a choice of three lift or drop speeds on the boom and gives delicate control for working close to pipes and foundations. Dual-circuit control also permits the operator to perform practically any two operations at once, such as swinging and lifting or swinging and dumping, without loss of pressure.

Completely mobile, the Hydro-Trencher is operated by one man. A convenient swivel seat swings from the tractor controls to the trencher controls in a few seconds.

Among other features reported are: exceptional bucket rotation that permits rock or dirt loads to be clamped against the boom to prevent slippage when loading, a 200-degree boom swing and a long side reach, a preset boom relief valve for constant digging power, and finger-tip controls.

For further information write to the Oliver Corp., Merchandising Dept., 400 W. Madison St., Chicago 6, Ill., or use the Request Card at page 18. Circle No. 220.

America's first great national highway was provided for in the Ohio Enabling Act of 1802. The first plan for a national system of highways and canals was put forward in 1808 by Albert Gallatin, Secretary of the Treasury, with the collaboration of Thomas Jefferson.



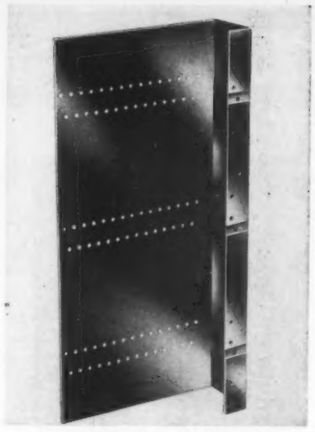
The new Worthington cutter with mulching attachment operates from a power takeoff.

Rotary Leaf Cutter and Mulching Unit

■ A new 72-inch power-takeoff rotary cutter with a leaf-mulching attachment has been introduced by the Worthington Mower Co., Stroudsburg, Pa. The unit, drawn by a Worthington Model G tractor, cuts through dense overgrowth. With leaf-mulcher added, it has the ability to reduce quickly leaves and other cuttings into a fine powder, putting nutriment back into the soil to improve the turf.

The machine features two staggered cutting bars that eliminate uncut streaks. Large 6:70 x 15 drop-center wheels are used for maximum flotation. The wheels are individually adjusted for height, from the ground to 10 inches, by two cranks.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 308.



The new Universal adjustable pilaster form.

New Pilaster Form

■ Forming pilasters of varying sizes is simplified with the new adjustable form manufactured by the Universal Form Clamp Co., 1238 N. Kostner Ave., Chicago, Ill. The re-usable form is adjustable for pilasters from 4 to 14 inches in depth in ½-inch increments, and from 2 to 8 feet in height.

The new form eliminates field fabrication and the delay of building pilaster boxes. It provides for positive pilaster sizes and can be used with standard Uni-Form panels.

For further information write to the company, or use the Request Card at page 18. Circle No. 198.

Improved Slide Rule Has Calculation Aids

■ A new slide rule with a unique scale arrangement and with design characteristics said to improve the accuracy of calculations is announced by the Frederick Post Co., 3650 N. Avondale Ave., Chicago 18, Ill. The Post Versalog slide rule is reported to have a number of new features.

The addition of $Root_1$ and $Root_2$ scales and the use of these scales in combination with the C and D scales equip the Versalog, a 10-inch rule, with the equivalent accuracy of a 20-inch rule, according to the manufacturer. These scale combinations are useful in the computation of squares, square roots, kinetic energy, moments of inertia, and other calculations in which multiplication by the square of a number is required.

A new technique used in color-coding trigonometric scales simplifies their use in conjunction with the C, D, and C1 scales. Calculations involving trigonometric functions can now be performed without the usual hazard of error by the simple operation of matching the color of the trigonometric scale being used with the same color of the corresponding C, D, or C1 scale.

The addition of a fourth set of scales, LL and LLO, has increased the range of the Versalog over that of conventional rules. The log scales cover a range from 1.001 to 22.000. The reciprocal log scales cover a range from .00005 to 0.999. These four log log scales and four reciprocal log log scales are arranged in decreasing powers of e outwardly from the center of the rule.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 221.

Names in the News

Major H. P. Burrell, special consultant for Franki Foundation Corp., New York City.

Burrell Takes New Post

The newly created position of special consultant for Franki Foundation Co., New York, N. Y., has been filled by Maj. H. P. Burrell. He will make his headquarters in the New York office of the company, contractors for Franki displacement caissons.

For the past 16 years, Maj. Burrell has been chief engineer for the Western Foundation Co., and prior to that, he worked for the Franki Concrete Pile Co. of Canada. He holds membership in both the American Society of Civil Engineers and the Corporation of Professional Engineers of Quebec, Canada.

Lamb & Son Promotions

Walter Lamb, formerly vice president, was elected president of Robert E. Lamb & Son, Inc., a construction firm of Philadelphia, Pa. He succeeds his father, Robert E. Lamb, who has been named chairman of the board.

Other changes include the promotion of Morgan C. Rulon, secretary, to executive vice president, and Edward I. Troiani, construction superintendent, to the new post of general superintendent in charge of all field personnel and operations.

William McQuade, new president of the Constructors Association of Western Pennsylvania.

Pennsylvania Group Elects McQuade

At its annual meeting at Pittsburgh, Pa., the Constructors Association of Western Pennsylvania elected William R. McQuade, of James H. McQuade & Sons Co., Pittsburgh, president for 1954. More than 150 contractors or their representatives attended the session and discussed current business conditions, labor problems, and such matters affecting the construction industry as the recently enacted wage tax.

Other new officers of the association include: vice president (heavy division), Allen D. McCombs, of John F. Casey Co.; vice president (highway division), Edward McCrady, Jr., of Edward McCrady, Jr., & Son Co.; secretary, Anthony A. Benintend, of Ben Construction Co.; assistant secretary, James A. Nardulli, of Nardulli & Sons, Inc.; and treasurer, Charles H. Booth, Jr., of Burrell Construction & Supply Co.

NCMA Elects President

M. E. Rinker, of Rinker Materials Corp., West Palm Beach, Fla., was elected president of the National Concrete Masonry Association for 1954. Mr. Rinker, elected at the association's 34th annual convention, will hold office until the 1955 annual meeting.

Serving as vice president for this year are R. I. Lampus, of R. I. Lampus Co., Springdale, Pa.; W. R. Ireland, Birmingham Slag Co., Birmingham, Ala.; and S. Carl Smithwick, Smithwick Concrete Products, Portland, Oreg. Carroll Strohm, Jr., Nashville Breeko Block & Tile Co., Nashville, Tenn., was re-elected secretary-treasurer.

M. E. Rinker, president of the National Concrete Masonry Association.

Charles H. Scholer, newly elected president of the American Concrete Institute.

Scholer Is New ACI Head

The head of the department of allied mechanics at Kansas State College, Manhattan, Kans., Charles H. Scholer, was elected president of the American Concrete Institute for this year. A member of ACI since 1924, Prof. Scholer serves on its research and fatigue of concrete committees. He has been a member of the board of directors and a vice president.

A teacher at Kansas State since 1919, Prof. Scholer is a member of several engineering organizations and has contributed four papers to the ACI *Journal*.

Elected for a two-year term as vice president was Frank Kerekes, assistant dean of the division of engineering, Iowa State College, Ames, Iowa.

New Canadian Turner V. P.

T. Robert Frost has been elected vice president of Canadian Turner Construction Co., Ltd., a wholly owned subsidiary of Turner Construction Co., New York, N. Y. Mr. Frost, who has been with the firm since 1934, was previously manager of the Toronto office of the organization.

Organize New Firm Of Denver Contractors

Heavy-industry construction of oil and gas pipelines, water lines, electrical conduits, mechanical installations, and piping of all kinds will be the specialty of a new firm of general contractors organized at Denver, Colo. G. R. Harris, Denver investment firm executive, is president of the organization, known as Harris Contractors, Inc.

Carl H. Breitwieser, also of Denver, is vice president and general manager. Other officers are Norman Smyth, secretary, and Barry Sullivan, treasurer. Directors, besides Harris, Breitwieser, and Sullivan, are C. C. Schrepferman, Arthur Bosworth, and Floyd Winslow, all of Denver, and Oscar R. Burden, of Tulsa, Okla. Executive offices are at 917 First National Bank Bldg., Denver, and field offices are at 1340 S. Lipan St., Denver.

Mr. Harris, corporate manager of Cruttenden & Co., investors, has been active in engineering, mining, and financial circles in the Rocky Mountain area. Mr. Breitwieser, a retired army engineer colonel, is best known for his work in 1941 and 1942 in directing construction of the Rocky Mountain Arsenal.

William Drew Heads BTEA Officer Slate

The new president of the Building Trades Employers' Association of New York City is William B. F. Drew, secretary-treasurer of J. L. Murphy, Inc., general piping contractors. He succeeds Fred J. Driscoll. The election took place at the annual meeting of the group, an association of 1,000 general and subcontractors.

Earlier, Peter W. Eller was re-elected chairman of the board of governors for a five-year term.

Other new officers include: vice president, Joseph A. Courter, president of Courter & Co., Inc.; second vice president, William N. Angus, president of William Angus, Inc.; third vice president, Eugene McGovern, vice president of Cauldwell-Wingate; and treasurer, Jack W. Zucker, president of the Shatz Painting Co. W. Arthur Riehl was re-appointed secretary.

New officers of the Building Trades Employers' Association, New York City, pose after their election at the group's annual meeting: Eugene McGovern, third vice president; Joseph A. Courter, vice president; William B. F. Drew, president; William Angus, second vice president; Jack W. Zucker, treasurer.

Mr. Drew is a member of the American Society of Mechanical Engineers and the American Society of Sanitary Engineers. He has been with the J. L. Murphy Co. for 33 years.

Construction Outlook Is Good, AGC Is Told

Industry, government and labor chiefs tell contractors' convention that 1954 will be a big year for building

THIS CAN BE the second best year in history for the construction industry. This was the optimistic forecast presented to the 35th annual convention of The Associated General Contractors of America, Inc., held March 1 through 4 at the Statler Hotel, Los Angeles, Calif. Over 2,000 contractors from the building, highway, and heavy construction and railroad divisions of the AGC heard spokesmen from industry, government, and labor give favorable opinions on the construction outlook for the year ahead.

Outgoing president of the AGC, C. P. Street, of McDevitt & Street Co., Charlotte, N. C., spoke of the increased competition for work among contractors, but warned that jobs should be bid on the basis of known costs plus a reasonable profit. He said it was inconceivable that contractors should be taking jobs at less than cost, even with the big backlog of construction. "Our biggest enemy is our own indifference to our responsibilities," he added.

Mr. Street was succeeded in office by John MacLeod, president of Macco Corp., Paramount, Calif., a construction firm that is active throughout the western United States and South America. The new vice president of the AGC is George C. Koss, president of the Koss Construction Co., Des Moines, Iowa, a well known concrete-paving firm engaged in highway and airport work in the midwest. William Muirhead of Durham, N. C. is secretary-treasurer.

Bright Future

At the opening session of the convention, Clifford F. Hood, president of U. S. Steel Corp., predicted a bright future for the country's construction industry. He expressed his belief that construction expenditures by industry and government will continue to be high, but said that the brightest picture centers around the estimates of construction contract awards for the coming year. These indicate another $34 billion in expenditures, and if the estimates are incorrect, as they were in 1953, Hood believed this figure could well approach $36 billion.

The steel executive said he felt that construction would continue at a high level of activity for several reasons. One of the most important factors he pointed out as contributing to the expansion of our economy is the increase in population, which by 1960 is expected to total 180 million. Other factors include population movements to the suburbs, increased school enrollment, and growing obsolescence of our cities—

John MacLeod, new president of the Associated General Contractors of America, Inc., with other officials at the 35th annual convention held in March at Los Angeles, Calif. Left to right: H. E. Foreman, managing director; C. P. Street, retiring president; Mr. MacLeod; George C. Koss, new vice president; and James D. Marshall, executive director.

all of which require construction of numerous facilities and highways.

This increased population factor was also recognized by Brig. Gen. C. H. Chorpening, assistant chief of engineers of the Department of the Army. The general expressed concern that while the country's population is growing at such a rate that it may be doubled by the turn of the century, the Army's civil works program has been growing smaller for several years. He urged the greater development of the nation's water sources, but also called attention to the postponement of many worthwhile projects because of the need for governmental economy.

In his annual report, H. E. Foreman, managing director of the AGC, stated that last year's construction volume was made up of $34.8 billion worth of new construction, and $11.7 billion worth of maintenance and repair work. He reported that the volume of new construction to be put in place during this year has been estimated at $34 billion.

Labor Secretary's Talk

The convention program was given a unique touch with the showing of a sound film that presented a talk by U. S. Secretary of Labor James P. Mitchell. A Cabinet meeting in Washington prevented the labor secretary from attending the convention. In his film talk, the secretary conceded that there has been some reduction in activity in the nation's economy as a whole, but he emphasized that this does not mean the country is "going from boom to bust. There may be a slight, but hardly significant, increase in unemployment for the next two months", Mr. Mitchell said.

"Then for another few months we will rest at that level. This is part of a necessary readjustment that we could only postpone, not avoid—and it is my view that we are better off getting it over with fast, rather than adopting schemes to postpone it which would themselves make the adjustment sharper, more painful, and more protracted when it does occur," the secretary added.

Division Meetings

The three divisions of the AGC held separate session meetings to discuss their particular problems. Welton A. Snow, manager of the building contractors division, in his year-end report touched on what economists call a "rolling adjustment," which is expected to taper off the total amount of construction for the coming year by 2 to 4 per cent as compared to last year.

"A boom of commercial construc-

tion is anticipated for 1954," Snow declared. "This increase in building was held back by World War II and subsequent controls on materials and construction, and was underestimated during 1953."

Arch N. Carter, manager of the highway contractors division, pointed out to that group the need for highway construction to keep pace with the increased demands of the motoring public. "Careful study of America's highway improvement problem by numerous organizations has placed the total construction needs of all highways at over $60 billion," he reported. "A state-by-state comprehensive study shows that improvements are needed on two-thirds of the Federal-aid highway system. Of the 673,137 miles in the Federal-aid network, 429,282 miles—64 per cent—need improvement."

A. E. Johnson, chief engineer of the Arkansas State Highway Commission and president of the American Association of State Highway Officials, addressed the road contractors. In discussing highway finance and the policy of allocating federal gasoline tax money for highway use, Mr. Johnson stated: "We (AASHO) do not subscribe to the theory of linkage, as it might be possible that in the case of recession there should be more money placed into highways than the 2 cent gasoline tax might earn. We believe that the money allotted to highways should be on the basis of need and not tied to any particular source of revenue at the Federal level."

At the meeting of the heavy construction and railroad division, Manager J. M. Sprouse stated that approximately one-quarter of all construction during the record year 1953 was for heavy and railroad work. Despite the heavy volume, 51 per cent of the contractors in this group completed the year with no lost-time accidents. A volume of only slightly less than last year is expected in the work of this division for 1954.

Prospects for Future

Other convention speakers expressed opinions reflecting the general optimism in a discussion of the topic: Future Business and Market Conditions. Carl F. Oechsle, U. S. deputy assistant secretary of commerce for domestic affairs, called the construction industry "one of the basic sustainers of our economy." He pointed out that the downward movement has been centered in—and largely confined to—the manufacturing industries which previously had chalked up the most rapid gains in production and sales. Mr. Oechsle suggested that the downdrift in manufacturing is something of a reaction to what went before in the nation.

Robert L. Gordon, vice president of the Bank of America at Los Angeles, forecast a "healthy readjustment in economic activity during 1954, but nothing like a major depression or even a serious recession."

Richard J. Gray, president of the Building and Construction Trades Department of the American Federation of Labor, tempered his optimistic forecast with reservations dependent on congressional action as to various construction programs. "We in the construction industry," the AFL spokesman said, "are the last to be hit by an economic slump and are always the last to get back on our feet when the slump ends. For these reasons, I think it is incumbent upon all of us to unite our efforts to seeing our legislatures and Congress speedily enact appropriate legislation to let all construction programs get under way as soon as possible."

Commissioner William A. Dexheimer of the U. S. Bureau of Reclamation discussed the current problems of the Bureau and how he and his staff are trying to overcome "legitimate objections to our slow methods of doing business and to our delays." He pointed out that in the past year the Bureau has reduced its personnel to about 10,500, with an annual savings in payroll of $13,000,000, "which is one of the steps the present administration has taken to cut down governmental expenditures."

Resolutions

A dozen resolutions were adopted by the convention, including a recommendation to increase to $900 million annually federal-aid returns to the states for highway purposes. The AGC also urged Congress to accept President Eisenhower's recommendation to make federal loans available where necessary to assist state and local governments in their public works planning. Another resolution called on labor and management to avoid further unwarranted increases in wage rates and to avoid also the adoption of welfare plans not suitable to the industry.

The annual banquet at the close of the convention was held at the Hollywood Palladium. Next year the meeting will be held in New Orleans, La. The Associated General Contractors has a total membership of 6,507 as of January 1, 1954. THE END

Booklet on Jaw Crusher

■ A booklet that gives full information on a jaw crusher made by the Traylor Engineering & Manufacturing Co., 509 Mill St., Allentown, Pa., has been announced. The Traylor Type M crusher is built in 8 sizes with capacities to 300 tons per hour.

The bulletin shows outstanding features of the crusher's construction in cutaway illustrations and exploded drawings.

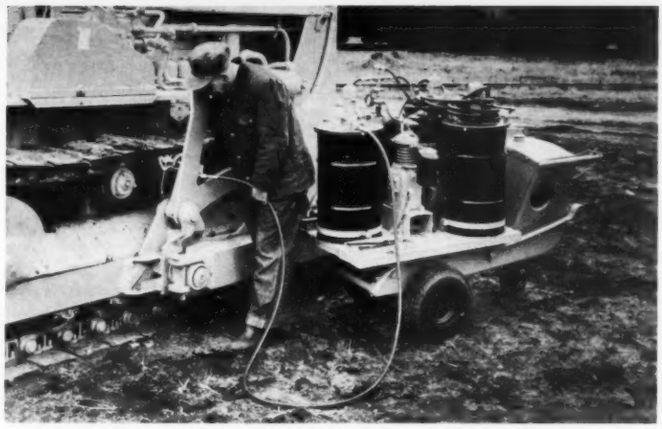
To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 278.

Powered Cart Converts Into Lubrication Unit

■ Lubrication equipment available for the Bell Prime-Mover motorized cart can convert this unit to a small self-propelled service station for the maintenance of heavy equipment. The mobile unit, made by the Prime-Mover Co., Muscatine, Iowa, is powered by a 6-hp Wisconsin engine, equipped with either rope starting or electric starting. The entire equipment, including compressor, air tank, space for three 100-pound drums, tool trays, service hoses, and lubricant pumps is only 31 inches wide. The machine travels over rough ground and up steep slopes and can be run up planks into a truck for long hauls between jobs.

The unit features Alemite equipment for handling motor oils, gear lubricants, and pressure-gun lubricants, as well as an air-delivery hose with tire chuck. Designed to use standard 100-pound drums of motor oil and lubricants, the self-propelled service station provides a low-cost method of maintaining construction equipment, insures timely service, and eliminates duplication of manpower and equipment.

For further information write to the company, or use the Request Card at page 18. Circle No. 296.



The Bell Prime-Mover, equipped for lubrication service, can get close to machinery to be serviced.

Improve Fuel Injectors For Diesel Engines

■ Several improvements in the GM unit fuel injectors used in its line of Series 71 diesel engines have been announced by the Detroit Diesel Engine Division, General Motors Corp., 13400 W. Outer Drive, Detroit 28, Mich. In the newly designed units, the injector valve assembly has been moved from its former location within the spray tip to a higher position, so that it is less exposed to high cylinder temperatures. The head of the new injector valve is now square rather than round in shape but maintains the former valve's crowned surface to insure maximum seat sealing. In addition, increased protection against compression pressure and heat is provided for the valve spring through a relocation of the check valve.

The number of wearing parts in the follower assembly, which transmits motion from the rocker arm to the injector plunger, has been reduced. Also, the follower spring is now stronger. Smoother and more complete fuel combustion while the engine is operating at part load is attained by a new plunger and bushing assembly. The new injectors are known as high valve injectors and are marked either HV6, HV7, or HV8. These symbols indicate new units of 60, 70, or 80-cubic-millimeter capacity, respectively.

New engines are now made with the improved injectors. Two parts kits are available to incorporate the same improvements into injectors now in use. One kit makes possible the use of new component parts, dipper tooth points and bases, and crawler treads, idlers, rollers, and sprockets made from Supermang, Oroloy, or Kenkrome.

For further information write to the company, or use the Request Card at page 18. Circle No. 295.

Replacement Chains For Gravel Plants

■ A new catalog describing replacement chains for cement, sand, gravel, crushed stone, brick, and clay plants is available from the Kensington Steel Co., 505 Kensington Ave., Chicago 28, Ill. Kenkrome chains cataloged include the bar, 700 and 800 pintle, miscellaneous pintle, rivetless, bar link, detachable link, combination, drag, and roller types.

Also covered in the bulletin are renewable tooth sprockets, crusher parts, dipper tooth points and bases, and crawler treads, idlers, rollers, and sprockets made from Supermang, Oroloy, or Kenkrome.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 207.

A 15-ton girder from one of the old bridges is removed by a Lorain crane to be placed on a waiting trailer.

Four-Lane Structures Replace Narrow Bridges

Composite decks of rolled steel beams and concrete slabs are built for two highway bridges over river in Michigan

SOON TO REPLACE three old and narrow bridges are two wide new structures which will carry Michigan Highway 46 over the Tittabawassee River west of Saginaw. Seven 75-foot spans carry the highway over the main river channel, while a supplementary three-span structure crosses an overflow channel east of the main river. Linking the two bridges is 100,000 cubic yards of roadway fill, placed to provide a high-level crossing of the entire valley. Construction, started in February, 1953, by L. A. Davidson, Lansing, Mich., is scheduled for completion late this fall.

The decks of both new structures have 26-foot roadways, separated by a 3-foot median and flanked by 4-foot sidewalks on each side. The over-all width of each deck is 65.5 feet.

Reinforced-concrete gravity-type piers and counterfort-type abutments are supported on untreated timber piles driven 30 to 50 feet into the subsoil below the river bottom. Since the composite deck has a concrete floor slab supported on rolled steel beams, shear developers welded to the beams assist in tying the concrete and steel into a working unit.

Beams are 36 and 33-inch WF rolled sections, varying in weight from 141 to 182 pounds per foot. While the spans are all 75 feet long, the beams are arranged in a series of cantilevers and suspended spans. Suspended spans approximately 58 feet long are pin-connected to the ends of beams from adjacent spans which overhang the piers by about 8 feet.

Remove Old Bridges

The old structures consisted of through plate-girders on concrete piers. Between the girders, a concrete slab was supported on a system of structural-steel floor beams and stringers. Davidson broke up the old concrete by having a Lorain Model 820 crane drop a 4,000-pound breaker ball on the deck. After the steel floor system was cut away, the 15-ton girders were removed intact, loaded on a truck trailer, and hauled to another site for re-use.

Ten old piers were removed to below the waterline and the broken concrete salvaged for riprap. Blast holes were drilled with Ingersoll-

Rand drills supplied with air by an Ingersoll-Rand 105-cfm compressor. Holes were loaded with Du Pont 40 per cent dynamite and shot to break up the old concrete.

Excavations for pier and abutment footings for the structure over the east overflow were dug without the necessity of sheathing. In the main channel, it was necessary to place a tight steel cofferdam. When the sheathing had been placed, the excess material within the cofferdam was clammed out by the Lorain 820 using a 2-yard Williams clamshell bucket.

A Super-Vulcan 50C steam hammer, driving the untreated timber piles to required bearing, was supplied with steam by a Dutton vertical boiler. A concrete seal was placed in the bottom of the excavation before the pier footings were poured. Forms for piers and abutments were of plywood with 2 x 6 studs and wales.

Mixing and Placing Concrete

Concrete batches were proportioned from a Butler cement plant and aggregate hopper located on the east bank. Bulk cement was received in truck trailers and unloaded into a ground-level hopper. A screw conveyor carried the cement from this hopper to the bucket conveyor. Then the material was elevated to the high-level storage tank which had a capacity of 250 barrels. Overflow from this high tank was stored in a 350-barrel surge tank.

Aggregates were batched from the 3-compartment bin which had a capacity of 35 cubic yards. Materials were batched directly to two Smith 5½-cubic-yard truck mixers mounted on Diamond-T 6 x 6 trucks. Footings were poured directly from the truck mixers. Piers and deck were poured from 1½-cubic-yard bottom-dump buckets hoisted to the top of the forms by a Northwest Model 25 crane. The truck mixers traveled on a temporary road across

(Concluded on next page)

A Smith 5½-cubic-yard truck mixer, delivering material directly from the batching plant, places a concrete seal around the wooden piling in the footing excavation.

Standing on the deck of the old bridge, a Lorain crane drives a test pile for one of the two bridges across the Tittabawassee River. *C&E Staff Photos*

Using a Williams 1½-yard clamshell bucket, this Lorain Model 820 crane excavates inside a cofferdam on the Tittabawassee River bridge job. The old pier in the background was later removed to below water level and the broken concrete salvaged for riprap.

C&E Staff Photo

(Continued from preceding page)

the dry overflow channel to reach the main river crossing, and here a temporary work bridge enabled them to deliver the concrete directly to the section being poured.

Quantities and Personnel

Roadway fill	100,000 cu. yds.
Channel change excavation	39,500 cu. yds.
Concrete	6,000 cu. yds.
Reinforcing steel	610,315 lbs.
Structural steel	2,026,330 lbs.
Riprap	6,000 sq. yds.
Steel bridge railing	1,860 lin. ft.
Peat excavation (about)	54,000 cu. yds.

General superintendent for L. A. Davidson on the project was Robert Mimms. Orville Romelhart was carpenter foreman, and J. C. Hunt was labor foreman. Project engineer for the Michigan State Highway Department was Ray Serier, who was assisted by Jim Miller, Marlin Metiva, and Charles Connelly.

THE END

Power Carts and Hoppers For Concrete Handling

■ Its complete line of concrete-handling equipment, including powered and hand carts, hoppers and batch plants, concrete buckets, wheelbarrows, and a variety of other equipment is illustrated in literature from the Gar-Bro Mfg. Co., 2415 E. Washington Blvd., Los Angeles, Calif.

The Gar-Bro power cart shown carries 12 to 14 cubic feet of concrete at 6 to 15 mph. It turns in a 4-foot radius. Eight models of portable and semiportable hoppers have capacities ranging from 2 to 4 cubic yards. Weigh hoppers and bin gates are illustrated in a large number of sizes and types. Twenty models of concrete floor hoppers have capacities of from ½ to 10 cubic yards.

The section on heavy-duty buckets lists models with capacities of from ¾ to 8 cubic yards in 13 models. Four models of lighter buckets have capacities of ½ to 1 cubic yard. Collection hoppers with a choice of discharges and transition chutes of various types are also shown.

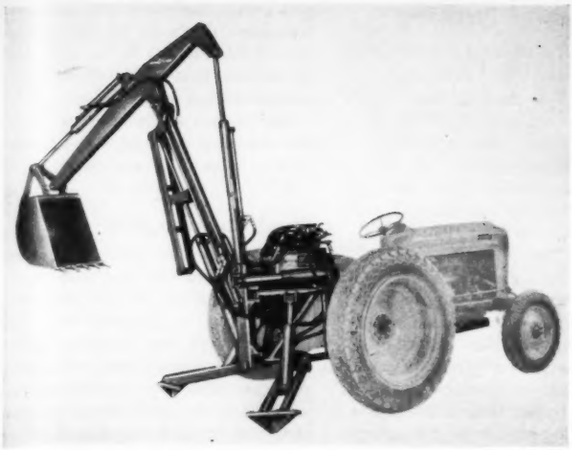
To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 203.

Data on Mason's T-Jacks

■ The availability of a new catalog sheet on mason's T-jacks has been announced by the Waco Mfg. Co., Department KP, 3565 Wooddale Ave., Minneapolis 16, Minn. The sheet describes the jacks' adaptability to uneven ground levels and their fast and easy erection. Sturdiness and light weight are other features reported.

Included in the sheet are on-the-job photographs and complete product specifications. The company also manufactures sectional steel scaffolding and shoring equipment.

For further information write to the company, or use the Request Card at page 18. Circle No. 242.



The improved Sherman power digger features a new design and method of mounting.

Backhoe for Tractors Has Greater Stability

■ Improvements are announced for the tractor-mounted hydraulic backhoe-type power diggers made by Sherman Products, Inc., 3200 W. Fourteen Mile Road, Royal Oak, Mich. The Sherman diggers are now adaptable for certain models of Case, International Harvester, and Ford-son Major tractors as well as Ford and Ferguson tractors on which they mounted in the past.

The units have an improved dip stick for added strength. The stick is available in two sizes for digging to either an 8 or 10-foot depth. The boom has been reinforced and has a greater bearing surface at hinge points on the dip sticks and swing frame for longer life and smoother operation. A redesigned swing control system provides better throttling control.

Another improvement is the use of hydraulic stabilizers that act separately instead of in unison to conform to the terrain. This feature makes it possible to dig plumb on slopes. The diggers also have new manganese alloy-steel teeth.

For further information write to the company, or use the Request Card at page 18. Circle No. 297.

Lightweight Joists Used As Formwork Supports

■ The use of latticed steel joists as form support for the construction of reinforced concrete or precast-block floors, ceilings, and arches is described in literature from the Webrib Steel Corp., 120 Broadway, New York, N. Y. The Hico girder obtains its strength by stressing and not by bulk. With sections available in three different sizes, spans of 4 to 27 feet or more can be covered by combining units. The sagging of large spans is overcome through tightening a turnbuckle. This cambers the span to compensate for the weight of the ceiling after the load has been applied.

The girders weigh only 10 pounds per foot and are carried easily. According to the manufacturer, it takes less than 40 minutes for two workmen to erect or take down girders covering an area of 1,000 square feet. It is estimated that the girders save up to two-thirds of the time needed for erecting auxiliary supports. By using different types of cross members and special end pieces, it is possible to adapt Hico girders to any kind of ceiling.

The literature illustrates the basic elements of the Hico system which includes intermediate sections made in 24, 36, and 48-inch lengths and supporting end sections adjustable to various lengths from 20 to 26 inches and 24 to 33 inches. The manufacturer states that the girders may be used repeatedly and will show little wear.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 199.

The Transo-Le Roi line of loaders offers torque converters and power steering as standard equipment.

New Front-End Loaders Have Torque Converters And Power Steering

■ Front-end loaders that feature a torque converter, power steering, four-wheel drive, and reversing planetary transmission as standard equipment are announced by the Transo Division of Le Roi Co., 1706 S. 68th St., Milwaukee 14, Wis. These new units range in size from ½ to 1½ yards in capacity.

The loaders have a patented bucket-rocking action and a scooping motion of the lift arms said to give a full bucket load without tire spinning and undue strain on the loader. The rocking action is the result of the rocking motion of the hydraulic cylinders, which are placed well back of the dirt-agitating area on the machines and afford extra reach. This motion, assisted by the traction of the loader, enables the operator to rock the bucket into the material.

The Model TLF-150 loader, offered in several sizes, can move to discharge points at speeds ranging up to 18 mph. Four-wheel drive and a low center of gravity aid traction so that the unit is able to go through sand, mud, or snow, or over rocky terrain.

The Transo loaders are powered by Le Roi heavy-duty engines and will also be available with diesel engines. Through the planetary-type reversing transmission and torque converters employed in all models, power is transmitted quickly and efficiently at low torque. Shock loading is cushioned by a spring-loaded clutch on the outside of the transmission. Clutches can be replaced in less than an hour. Compact grouping of torque converter, engine, transmission, and clutch at the rear of the unit makes for easy access for maintenance.

The heavy cast-iron grills which protect the rear end also act as counterweights, eliminating poor road clearance. Operator vision is reported to be especially good due to the low 36 to 48-inch normal carrying position. The low carrying position is also a safety feature.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 185.

New Lima Department

The Baldwin - Lima - Hamilton Corp., Lima, Ohio, has appointed Thomas J. Hunter manager of the newly created sales promotion department at the Lima works.

Sewer-Joint Packing

■ A new nonporous sewer-joint packing has been developed by Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo. Ropax is especially recommended by the manufacturer for sealing where adverse soil conditions and excessive ground water are encountered and where low infiltration requirements demand tighter joints.

The packing consists of a processed fibrous core, completely impregnated and saturated with a blend of asphalts containing an inhibitor to prevent the growth of bacteria and fungi. When caulked back in the pipe bell, Ropax is said to form a solid seal impervious to the passage of water. It also allows for better pipe alignment.

The product is reported to be comparable in price per pound to other porous packing, such as jute. Available in diameters of ⅜, ½, ¾, 1, and 1¼ inches, it is furnished on convenient-to-use spools.

For further information write to the company, or use the Request Card at page 18. Circle No. 176.

Steel Storage Bins

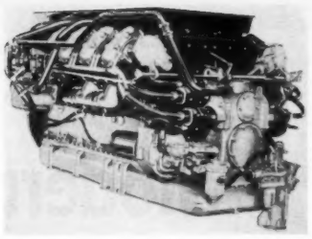
■ A new booklet on steel storage bins of 65 to 400-ton capacity is being offered by the Heltzel Steel Form & Iron Co., Warren, Ohio. The literature tells how to use and how to plan for modern overhead aggregate storage bins. Multicompartment arrangements and gate and discharge methods are discussed.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 179.

Expanded Engine Line Offers Higher Ratings

■ The series of high-output internal-combustion engines developed by Continental Motors for tanks and military vehicles is now available for commercial use, according to the company. This increases the output ceiling of this line of engines from 200-plus hp to more than 1,000 hp, augmenting the variety of jobs on which these units can be used. The new models have ratings ranging from 375 to 1,040 hp.

High output combined with light weight, compactness, versatility, and ease and economy of servicing, are features claimed for these power units. Models available include the 6-cylinder 375-hp AO-895-4, its 500-hp supercharged version, the AOS-895-3, and the 12-cylinder 810-hp AV-1790-7, the supercharged version of which develops 1,040 horsepower.



The Continental Motors Corp. Model AV-1790-7 engine is a 12-cylinder 810-hp unit.

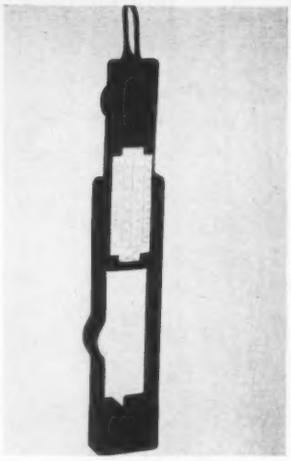
For further information write to the Continental Motors Corp., Muskegon, Mich., or use the Request Card that is bound in at page 18. Circle No. 183.

Pocket Clinometer

■ An instrument designed for reading vertical and horizontal angles in preliminary surveys that also serves for the determination of distances is offered by Geo-Optic Co., Inc., 170 Broadway, New York 38, N. Y.

The Geo Clinometer is used by surveyors to measure in close and intersected terrain, as well as for surveying steep roads where it is difficult to work with regular types of surveying instruments. The instrument is handy for sighting points and for checking possible measuring errors.

Contractors, civil engineers, and architects use it to determine the measurements required for estimating the cost of building projects. If handled carefully, it will also serve for precise measurements of distances and elevations, or for surveying profiles.



The Geo-Clinometer.

The instrument is supplied in one design with two graduations: a standard degree graduation of 360 degrees, and a graduation in percentages. The reading of one degree corresponds to an elevation of 1 yard at a horizontal distance of 100 yards. The reading of 100 degrees corresponds to an angle of 45 degrees. For measuring small angles, there is a short scale subdivided in half degrees.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 299.

Aluminum Roofing

■ Enlarging its line of roofing materials, the Aluminum Company of America has added a new lightweight corrugated-aluminum sheet. Made of the same alloy as the standard .032-inch material, the new roofing and siding product is only .024 inch thick.

The .024-inch sheet is supplied with corrugations ⅞ inch deep and a 2.67-inch pitch identical to the .032-inch standard product. This new sheet can be used with substantial economies for both new construction and re-roofing jobs. It is well adapted to use as the inner sheet or as both inner and outer sheets of insulated wall construction with a center section of insulating material such as glass fiber.

For further information write to the Aluminum Company of America, 805 Alcoa Bldg., Pittsburgh 19, Pa., or use the Request Card at page 18. Circle No. 300.

Floodlight Projector

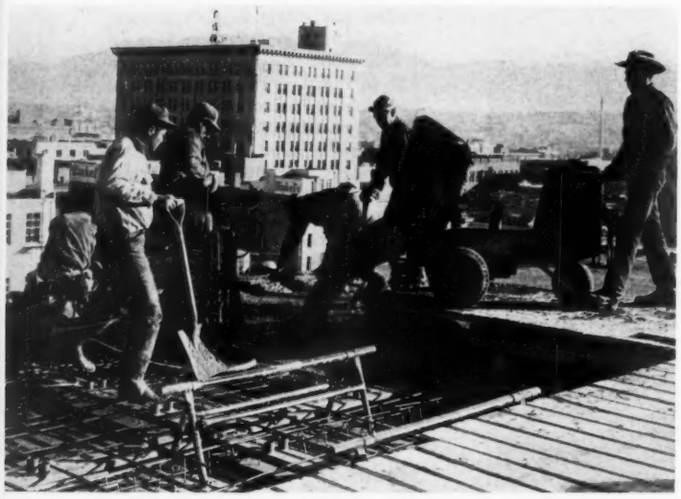
■ A floodlight projector for contractors is shown in literature from Wm. W. Lee & Son, 20 E. Jackson Blvd., Chicago 4, Ill. The Tilley floodlight projector burns 40 hours on 6 pints of ordinary kerosene or No. 1 diesel oil. It produces a white light of 5,000 cp and throws a beam that reaches out approximately 150 x 75 feet.

The literature shows the unit mounted on a 5 to 8-foot telescopic tripod with a revolving base. The projector is also mounted on a short stand.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 258.

Concrete is lifted in this 175-foot Gold Medal tower to one of the upper floors of the Simms Building where it is discharged into a Whiteman power buggy.

Prefabricated runway panels are supported by Lite Wate folding scaffolds. Easy to install and remove, the scaffolds have narrow tubular legs which fit easily between reinforcing bars.



As a Bell Prime Mover dumps concrete to a slab pour, workmen consolidate the material with Mall vibrators. A Lite Wate scaffold, used in supporting the runways, is in the foreground.

Modern Methods Speed Concrete Work on Office Building

Mechanical shores and scaffolds for buggy runways help crews in pouring concrete for 14-story structure

By RAY DAY

REACHING SKYWARD, the new 14-story Simms Building in the heart of downtown Albuquerque, N. Mex., is rapidly becoming a major addition to the city's impressive skyline. Lembke Clough & King, Inc., Albuquerque contractor, started work April 6, 1953, and hopes to have the structure finished by July 31. When completed, the building will be among Albuquerque's most impressive structures, dominating the skyline's Hilton Hotel and the Federal Building. Designed principally as an office building, it will cover a city block. A single story, 14 feet high, will cover the block, and out of this structure will rise the 12-story section of the building, measuring 60 x 156 feet. At its top, a patio floor and penthouse will create, for practical purposes, a 14-story building. The structure's full basement rests on a reinforced-concrete floating-type foundation in which concrete quantities are heavy.

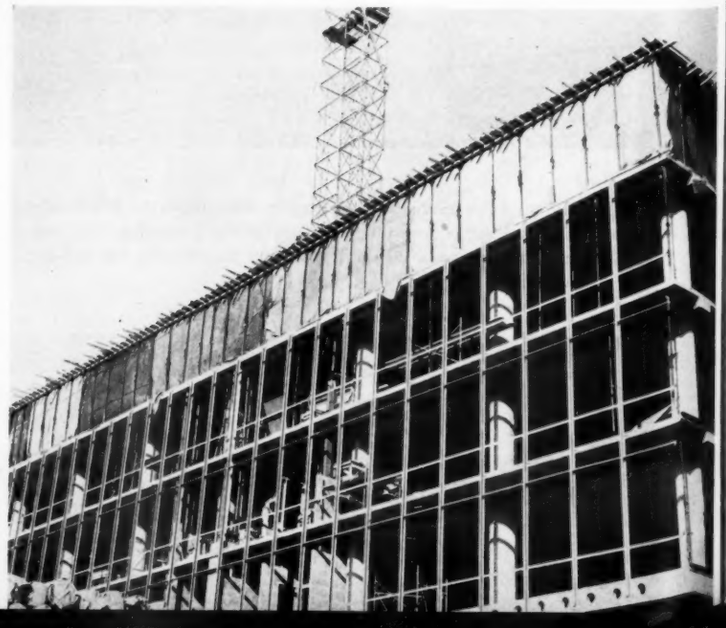
Modern Features

The Albuquerque engineering firm of Max Flatow-Jason Moore is responsible for the modern and functional architectural features of the building. The east and west walls of the high section are of solid roman brick, while the north and south walls are of solid aluminum framing and glass panels.

The 6-inch reinforced-concrete floor slabs, containing exceptionally wide beams, cantilever 5 feet outside their supporting columns. These columns are 32 inches in diameter from the basement to the first floor, 28 inches through the sixth floor, 22 inches through the twelfth floor, and 16 inches through the fourteenth floor. The floor beams are 60 inches wide and 15 inches deep on the ground floor. From the third to the seventh floor, they measure 60 x 14½ inches. Outside roof beams are 28 x 14½ inches.

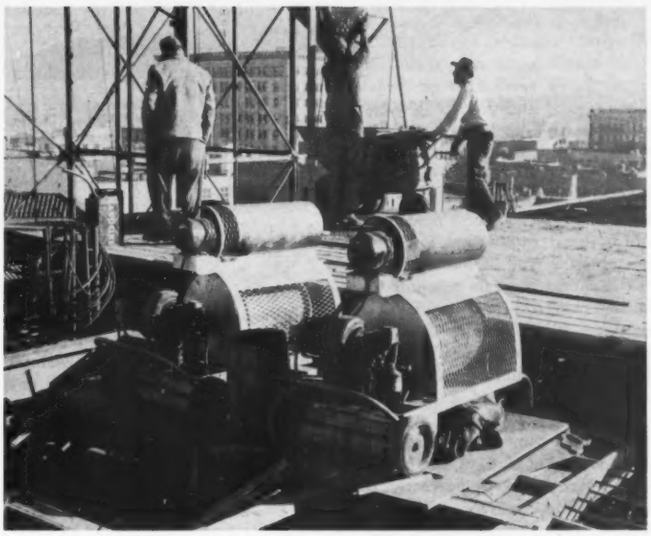
Reinforced-concrete footings make up the structure's floating foundation. These footings contain large quantities of concrete; the first two footing pours alone contained 423 cubic yards of the material. Footings are 30 feet wide, from 40 to 44 inches deep, and are reinforced with steel up to 1¼ inches in size. One of the features of the foundation design is a wood pile driven 18 inches in the clear of the concrete just below each column point. This consolidated the natural sand overburden, which foundation investigations revealed to be more than 700 feet deep.

In line with the building's functional design, it has an all-year air conditioning system which makes use of the heat pump method of heating and cooling. Two wells, measuring 700 and 742 feet deep, will furnish water for this operation. Radiant panels in the ceilings will provide



Outside steel is erected on lower floors while Acrow shores are set in place to support forms for the next pour. The 6-inch reinforced-concrete floor slabs cantilever five feet outside their supporting 32-inch columns.

Acrow shores support a fifth-floor pour. A total of 3,000 shores used on the job allowed two floors to be equipped at the same time.



Since concrete work was carried on through cold weather, Silent Glow heaters were used to keep the green concrete warm and to start the cold engines of power buggies.

heat, while ducts, leading through the ceiling, will be used for cooling purposes.

The suspended acoustical ceilings are of Fiberglas. While the ground floor will be finished in terrazzo, the upper office floors will be of asphalt tile. Hausserman movable partitions will finish off the interiors of each of the floors.

Basement Excavation

The 7,800-cubic-yard basement excavation assignment was farmed out on a subcontract basis to Universal Grading Co., Albuquerque, which also took the job of driving the wood piles under each column site.

For this work, Universal moved in a Byers ¾-yard shovel and a fleet of five Ford and Chevrolet 5-yard dump trucks. The soft sand was moved out rapidly at the rate of about 800 cubic yards per day. This material was disposed of in private areas in and around the city.

Under the general supervision of M. Borthwick, a rugged 50-year veteran of the building trades, concrete work moved ahead rapidly. Almost every 2½ weeks, another floor was completed.

Borthwick saved time, expense, and trouble by using special steel wale brackets on the basement wall, Acrow mechanical shores for the support of all concrete floor pours, a power-buggy method of placing concrete, and some unique Lite Wate lifetime folding scaffolds for the support of the concrete-buggy runways. These special steel supports, built like saw horses, are easily set down among the reinforcing steel bars. Easy to handle and pick up and capable of being re-used indefinitely, they are manufactured by Wilnau Mfg. Co., Glendale, Ariz.

According to Borthwick, he first replaced the usual wood shores with Acrow patented shores in a job on the geology building at the University of New Mexico. His company first purchased 600 of these units, and they were so satisfactory that 1,000 more were bought. A total of 3,000 of these shores in three sizes was used on the Simms' job so that two floors could be equipped simultaneously.

The concrete forming job for all flat slabs and the basement walls was done with plywood facing, 2x4 studs and wales, and form oil.

(Concluded on next page)

(Continued from preceding page)

Wherever possible, Borthwick used floor panels again and again. The beam forms were also constructed along typical lines so that they could be re-used. Since the beam dimensions changed as the building rose, it was necessary to make a new set of forms to suit the varying beam sizes. These forms were made at the site by a carpenter crew, which also did erecting and stripping.

The round concrete columns were formed with the aid of steel forms supplied by Steelform Contracting Co., Los Angeles. Easy to install, these forms came in two halves, and could be re-used.

Although the concrete was designed for a compressive strength of 5,000 pounds at 28 days, the material was proportioned so correctly that average compressive strengths of 6,000 pounds or more were obtained from the design. A 1-cubic-yard batch was composed of:

Sand	1,150	lbs.
¾ to No. 4	1,825	lbs.
Cement	689	lbs.
Water	302	lbs.
Pozzolith	2.93	lbs.

Because of the efficient method used in handling concrete, pours were made at a high capacity. The 423-yard foundation pour was handled in a little more than 6½ hours. It was customary to handle one of the 200-yard floor pours in about the same time. Albuquerque Sand & Gravel Co. supplied the concrete to the job in a fleet of Blaw-Knox truck mixers, which backed in to discharge their loads into the hopper of a tower-mounted hoist. A 2-drum hoist, driven by a Minneapolis-Moline engine, handled the concrete hoisting bucket as well as a passenger and freight elevator which were also enclosed in the Gold Medal 175-foot tower. This tower, equipped with a Chicago boom, was set up on the north side of the building.

Concrete, after being hoisted to the proper floor, was then discharged into a conveniently located receiving hopper. There, motor-powered buggy equipment, a Whiteman and three Bell machines, using wooden runways, picked up the concrete and brought it to its point of placement.

The wooden runways used by these machines have an improved type of steel support which is small, strong, and easily handled, giving positive support to the prefabbed runway panels. Having narrow tubular legs which fit easily between the steel reinforcing bars, the lightweight folding scaffolds are easy to install and just as easy to pick up when concreting is finished.

The floor pours were made using two principal runways from the hoisting tower and installing occasional T-runways off the ends to carry the concrete out to the edge of the floor. As the buggies dumped the material, two Mall vibrators consolidated the mix. Then cement finishers screeded the slabs off at the proper levels.

Since concrete work was carried on through exceptionally cold winter weather, salamanders were used to give added heat to the green concrete after it was poured. The job was also well supplied with Silent Glow heaters, which have proved invaluable for keeping concrete warm and for starting the cold engines on power buggies.

As soon as a floor pour was completed, preparations went ahead rapidly to set the column forms and start work on the next level. In spite of the winter weather and an occasional labor dispute, the job went ahead at a fast rate. A floor was finished about every 15 days. Borthwick, as general superintendent of building, supervised all the work of the various specialty contractors.

The new Simms Building represents one of the densest concrete jobs seen in the southwest in years. Optimum vibration produced concrete surfaces which are absolutely free from rock pockets and have a minimum of air bubbles. The result is a strong and durable finished concrete job for one of the most distinctive pieces of architecture in New Mexico. THE END

Patching Material For Concrete Floors

■ A ready-mix modified asphalt preparation with a bituminous aggregate for the repair of holes in concrete floors is made by the Warren Refining & Chemical Co., 5151 Denison Ave., Cleveland 2, Ohio. Jet Patch is a coarse-grained material said to have the ability to feather-edge and become an integral part of the floor. Speed of application and the product's resistance to squeezing out are characteristics stressed by the manufacturer. The material, which is packed in 30 and 55-gallon drums, is shoveled into the hole or spalled area and tamped down.

Suggested uses for Jet Patch include covering spalled areas and building ramps, leveling around machines and worn aisles in factories, and repairing ruts and holes in concrete or macadam driveways. The manufacturer states that once the patch material is laid, neither rainwater nor the normal washing down of floors will affect it. Similarly, it will not be affected by motor oils and gasoline drippings found at loading platforms and machine shops.

For further information write to the company, or use the Request Card at page 18. Circle No. 195.

Le Roi Engineering Head

Hershel V. Hiatt has been named director of engineering for the Milwaukee division of Le Roi Co., a subsidiary of Westinghouse Air Brake Co. He was formerly chief engineer for the Allison Division of General Motors.

Elevator Attachment For Motor Graders

■ An elevator for the Models 99-H and Master 99 Austin-Western power graders is offered by the Johnson Mfg. Co., Lubbock, Texas. The Johnson elevator is designed for loading, casting, stripping, ditching, terracing, building shoulders, widening roads, building levees and diversion channels, and similar operations. It attaches easily without altering the grader in any way.

A feature of the elevator is its independent suspension which allows the unit to be moved by hydraulic controls on a horizontal, transverse, or vertical plane, or a combination of these planes. This makes it possible to control from the cab (using the standard grader controls) the width and depth of cut and the cutting of back-slopes.

The Johnson elevator for Austin-Western motor graders is hydraulically controlled.

The independent suspension, plus the fact the operator may steer both front and rear wheels of the Austin-Western graders, enables the rear wheel to run directly behind the disk at all times, eliminating side-draft. It also eliminates any tendency to crowd into the cut or slide away from it, regardless of the width of cut or the slope of the ground.

It is also pointed out that the unit's hydraulically controlled gage wheel allows the plow beam to float independent of the frame of the motor grader. The gage wheel maintains a constant depth of cut. Any depth of cut from 5 to 28 inches and any width of cut from 8 to 26 inches can be made.

Since no heavy subframe is used, the operator has good visibility and the total weight of the attachment is reduced. The conveyor, which uses four-ply heavy-duty corrugated conveyor belting of endless construction, is either 14 or 19 feet long. The belt width is 48 inches. Belt speed is 750 fpm.

For further information write to the company, or use the Request Card at page 18. Circle No. 201.

Twin-Cylinder Hoist For Pickup Trucks

■ A new model universal-mount hoist for use on ½, ¾, and 1-ton pickup chassis has just been announced by the National Lift Co., Ypsilanti, Mich. With the 1954 model Dump-O-Matic hoist, a pickup ordinarily used only for hauling can be converted to a multipurpose dump truck with the use of a simplified kit of mounting brackets. Mounting time has been reduced up to 20 per cent compared to that required for previous models, it is reported.

The twin cylinders of the universal-mount Dump-O-Matic are low slung between the truck chassis frame to permit a lift point well ahead of the body hinges for greater leverage. According to the manufacturer, the design of the welded all-steel hoist subframe eliminates lifting stresses that strike at the truck's weakest point, just back of the cab.

Hydraulic power for the hoist is supplied by a new fan-belt-driven Hydra-Clutch pump. Mounted on top of the truck engine, the pump is safe from splashed water and road dust. It draws just one hp to lift the 6,000-pound-capacity load. The pump permits the new hoist to be used on any pickup chassis, including those with automatic transmissions or standard transmissions, without power takeoff openings.

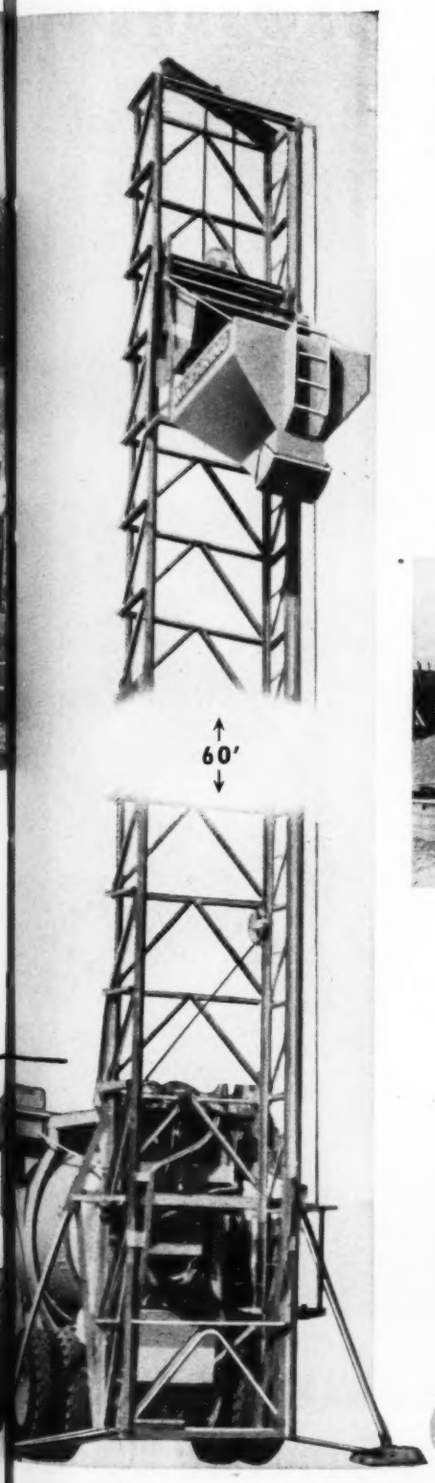
For further information write to the company, or use the Request Card at page 18. Circle No. 182.

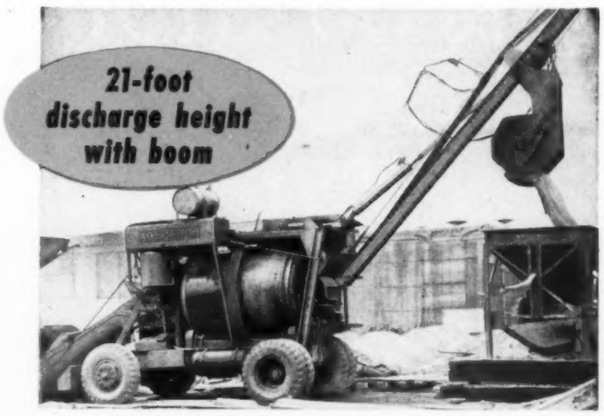
Trencher Line Illustrated

■ A bulletin describing its complete line of trenching equipment has been published by the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. The inside of the four-page bulletin has been arranged to permit a simple quick comparison of the digging capacity and specifications of the Cleveland Trencher Models 92, 95, 110, and 140. These machines are recommended for city and suburban utilities and pipeline trenching from 10 to 30 inches wide and up to 5½ feet deep. The text describes specific advantages, typical job applications, and special construction features of each model.

The Cleveland Model 80 backfiller, side crane, and tamper is also discussed. Action photographs illustrate the units at work on different trenching jobs. The back page features the company's big pipeline machines: the Model 320 trencher and the Model 190 backfiller.

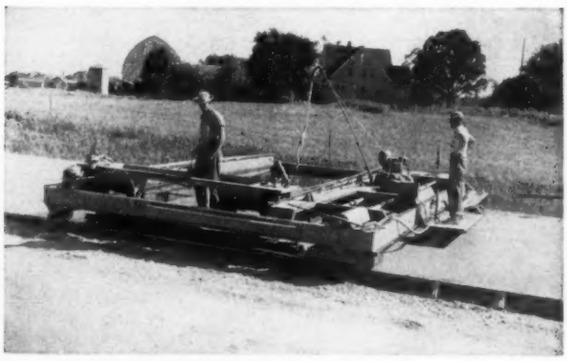
To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 301.





Koehring 16-E *twinbatch* is never "grounded". Bucket discharges anywhere along 25-foot elevating boom. Clamshell door on 24-cu. ft. bucket is hydraulically operated, opens or closes at any time for controlled discharge.

On large-volume paving, Koehring's big 34-E *twinbatch* hits top output of 86.7 batches an hour (60-sec. mixing time). This reserve capacity offsets normal job delays, assures an average of 50 batches hourly, 8 hours a day, at no increase in batching, hauling or finishing equipment.



"Timely", precision-finishing is important on any paving job. Koehring Longitudinal Finisher operates at almost twice the speed of a 34-E paver, produces mechanically-accurate concrete slabs, 8-to-30-ft. wide, uniform crown transitions.

Asphalt Road Helps Change Barren Island Into Resort

By J. E. Wood, Material Engineer,
Maryland State Roads Commission

WINDSWEPT Assateague Island, formerly a barren stretch of sand dunes and marsh grass lying off the Maryland coast, is now preparing to assume the holiday attire of a resort area. This long slender spot of land is being developed by Leon Ackerman, Washington, D. C., realtor, as the Ocean Beach Development, and one of the major projects of the current improvement program is the construction of a 15-mile section of 16-foot roadway at Ocean Beach.

A major problem at the very beginning of the job was the difficulty of securing materials at the construction site. Since the project was inaccessible by land, the maximum use of material available locally was almost mandatory.

But even after this and other initial problems had been worked out, wind and weather combined to hamper work as severe storms swept the island, washing out the partly completed project in several sections. At times, it became necessary to remix and recap finished 5-inch sections of the road which were flooded to a depth of more than a foot.

One of the first difficulties faced by Woods Construction Co., Hollywood, Calif., was the problem of bringing materials to the island from the mainland. While the inaccessibility of the project dictated the use of locally available material, a preliminary survey revealed the area to be one of shifting beach and dune sand, the surface of which was quite near the water table. These features of the terrain ruled out any extensive earth-moving operations to raise the roadbed.

To provide an acceptable roadway and yet stay within the limits of the budget, the project engineer specified a bituminous stabilized sand-mix pavement, constructed by road-mix methods. However, an analysis of the sand gradation gave these results:

Sieve Size	Per Cent Passing
No. 10 sieve	100
No. 40 sieve	55-75
No. 80 sieve	8-12
No. 200 sieve	0- 1

The Florida bearing value test for sands showed an untreated bearing value of 20. With low traffic density roads having a minimum standard of 30, it was apparent that an admix would have to be introduced to improve the stability of the sand and meet design requirements. Since no suitable material for this purpose was discovered in a thorough survey of the island, it was decided to import an admix of slag or stone screenings onto the island. With about 20 screenings added, the Florida bearing value was increased sufficiently to meet minimum acceptable design standards. However, a cost analysis showed that this would increase job costs considerably, and since economy was a vital factor in the job, the idea of using an admix was dropped. Emulsified asphalt was finally selected as the bituminous stabilizing agent.

Because of the existing water table, the sand contained a high percentage of water, precluding satisfactory road-mixing with any other type of asphaltic material. However, working with American Bitumuls & Asphalt Co., it was found that a relatively hard base stock asphalt of 50 to 100 penetration increased the stability of the mix. For example, emulsion from a 150-penetration asphalt showed a modified Florida bearing value of 60 for the mix, while a 75-penetration asphalt showed a modified Florida bearing value of 120. Typical test results showed that the bitumen selected for the project had a penetration of residue of 75.

Barges were used to take the asphalt from the mainland to the construction site on Assateague Island. Transported in tank trucks from Baltimore to the nearest docks by Asphalt Service Co., Baltimore, the material was then pumped into the barges and taken the 2½ miles by water to the island. At Ocean Beach, the asphalt was pumped into tank trucks by Roper gear-type pumps, then transported to the job.

Barges and tank trucks transport bitumen to construction site as 15-mile roadway is built across low-lying island

The contractor used a Woods Roadmixer to process the stabilized sand-mix base. The 3,000-gallon asphalt transports were towed by a separate tractor alongside the Woods Roadmixer which the contractor used to process the stabilized sand-mix base. Asphalt was fed from the tank trucks into the pugmill of the traveling plant mixer by means of a gear pump on the machine. The Woods Roadmixer was pulled by a Caterpillar D8 tractor which had a power takeoff driving the pugmill.

Ahead of this machine, auto patrols formed windrows of the sand, providing the 5-inch compacted thickness needed for the 16-foot road. Then the asphalt mixture was introduced. After being knocked down by a bulldozer, the material was aerated, bladed to proper cross section, and laid away by means of an auto patrol. With the particular grade of asphalt used, very little aeration was required. Since the mix was laid on a shifting unstable sand subgrade, it was necessary to use extreme caution in laying out the mix to insure a uniform thickness through the cross section.

After blading, the mix was compacted with a pneumatic-tire roller, and a final rolling was done with a 5-ton steel-wheel tandem.

This last rolling produced very little surface marking. But as has been expected, the finished road has shown some surface marking, due to the exclusion of the admix. However, it is felt that as oxidation takes place in the asphalt, the surface will harden, allowing this condition to be corrected with a surface treatment of crushed stone or slag. As yet, no seal coat has been placed over the roadway, but this work will probably be undertaken shortly.

THE END

From a paper presented at the recent annual meeting of the American Road Builders Association in Atlantic City, N. J.

Data on Subgrade Planer

■ A subgrade planer is described in literature from the Shovel Supply Co., P. O. Box 1369, Dallas, Texas. Designed for highway and airport paving, the Ferguson subgrade planer cuts a 22 to 25-foot-wide subgrade for concrete pavements 6 to 17 inches thick. The manufacturer reports that this rigid planer will not deflect in any direction when operating at a normal tractor speed. Longer-blade models are available to cut any cross section of grade desired.

Features described in addition to width adjustment and rigidity include one-man control. Having a moldboard like a maintainer, the unit accurately shaves high spots and rolls dirt forward into low areas. When it is necessary to back up, the tractor operator pulls a rope controlling one lever that raises the planer blade. After backing, the operator pulls a second rope and the blade returns to its original level.

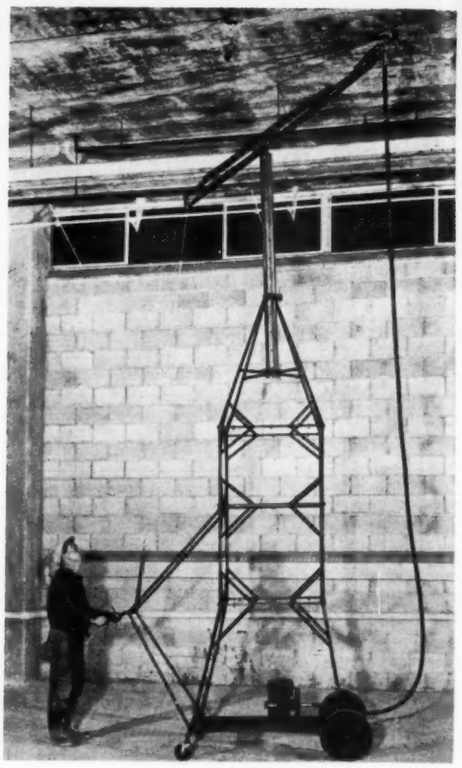
The planer travels on standard steel paving forms on four independently adjustable wheels. Where concrete is poured in strips, rubber-tired flanged wheels are available to ride on a previously paved strip, thus preventing marking or damage.

The literature also describes a scarifier attachment for the planer. Complete specifications are listed.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 259.

Highway Equipment Assigns

The appointment of Phil Terry as new eastern district manager for Highway Equipment Co., Inc., Cedar Rapids, Iowa, has been announced by the company, manufacturer of a complete line of spreaders and bulk delivery equipment. He will have headquarters in Carlisle, Pa., for a territory including 13 eastern states and the District of Columbia in the United States, and Quebec, eastern Ontario, and the maritime provinces in Canada.



The tallest of this Giraffe ceiling grinder reaches to a height of 20 feet. It eliminates the need for scaffolding.

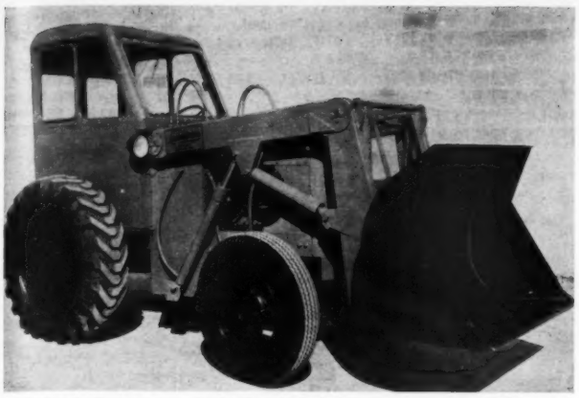
Ceiling Grinder Has Long-Reach Mounting

■ New larger models of its concrete-ceiling grinding machine that eliminates the need for horses, planks, deckings, and scaffolds are announced by the Concrete Grinding Corp., Department R, 300 Straight St., Paterson, N. J. The long-reach grinder also does away with the hand use of rubbing stones and the need for goggles and masks.

The machine consists of an adjustable grinding head attached to a rubber-tire-mounted metal frame that makes it possible for the grinding disk or stone to reach ceilings from 7 to 20 feet high. The grinder is offered in two models, the Giraffe for working at a 7 to 9-foot height, and the Hi-Giraffe that reaches up to 12 feet high. Larger sizes, including a new 20-foot unit, are available on special order. In producing a smooth concrete surface, the Giraffe grinder not only removes fins, ribs, and board marks but also nails used to secure hangers and light boxes to the formwork.

The disk is driven by a flexible shaft connected to an A. O. Smith 110-volt ac motor delivering ¾ hp. A turnbuckle controls the pressure of the disk.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 302.



The Model HF-15 Lessmann Loadall now has a new grill design that protects the front-end hydraulic pump assembly. All three models in the line have hydraulic power-crowd feature.

Tractor-Loaders Have New Design Features

■ Design improvements for all three models of its tractor-loader have been announced by the Lessmann Mfg. Co., 20th and Easton Blvd., Des Moines, Iowa. The perforated grill and fabricated hood has been replaced with a cast grill with horizontal louvers. In addition to a more streamlined appearance, the design change is said to offer greater protection for the front-end Vickers hydraulic pump assembly without sacrificing accessibility.

The Model HF-15 Lessmann Loadall is 11½ inches longer and 1,200 pounds heavier than the standard Model HF-10 and is equipped with a full-reversing transmission as standard equipment. On Models HF-10 and HF-5, full reversing transmission is optional equipment. In addition, all three models may now be equipped, if required, with an all-steel all-weather cab with windshield wipers and safety glass.

The Model HF-15 unit carries 13:00 x 24 eight-ply grader-type tires and 8:25 x 20 ten-ply front tires. It is an all-purpose ¾-yard loader that may be equipped with buckets up to 1½ yards in capacity for handling bulky materials. Optional equipment on this model Loadall includes both Bendix Hydro-Vac brakes and Vickers power steering.

All three models now have the Lessmann hydraulic power-crowd feature which makes possible the easy loading of heavy or compact material by a forward sweep of the bucket. This scooping action, entirely independent of the motion of the unit, is accomplished by two extra-heavy-duty hydraulic cylinders used exclusively for that purpose. The manufacturer claims that conditions of traction have little or no effect on the work capacity of the Lessmann Loadall since power is never applied to the driving wheels during the scooping portion of the loading cycle.

Drawbar, work lights, a rear safety light, and a starter are standard equipment. A dozer blade, lift forks, and a crane hook are also available as optional equipment for all three models.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 212.

Data on Electric Hoists

■ A new bulletin on Coffing Quik-Lift electric hoists is now available. Included in the literature are descriptions of performance and safety features and cutaway drawings showing details of construction.

Complete specifications and dimensions of 17 models ranging from 500 to 4,000 pounds in capacities are given. The bulletin also contains pictures and descriptions of various electric hoist accessories.

To obtain this literature write to the Coffing Hoist Co., 800 Water St., Danville, Ill., or use the Request Card at page 18. Circle No. 219.

Roofing Costs Are Cut in Plant Construction

By H. S. FREEMAN, Purchasing Agent, Construction Division
E. I. du Pont de Nemours & Co., Inc., Pompton Lakes, N. J.

DEVELOPING NEW cost-cutting techniques in material handling can be made to pay off as handsomely for any job as it has in the construction of an addition to the E. I. du Pont Co.'s Pompton Lakes Works in New Jersey. There, the cost of erecting a reinforced precast-concrete roof has been cut by six cents per square foot through the inception of a relatively simple material-handling procedure.

Now in the final stages of construction, the Pompton Lakes facilities have a built-up roof of reinforced precast-concrete slabs 2 feet wide, 6 feet long, and 3¾ inches thick. Each slab weighs about 200 pounds.

Unloading these slabs, moving them to the erection site, and setting them in place is a long and costly process. Normally, they are shipped to the plant by boxcar, unloaded one at a time by laborers, placed on a truck, then moved to the building site. There they are unloaded and raised to the roof of the building by either a stationary lift or crane. All these steps contribute to the total cost of 20 to 35 cents for putting each square foot of roof in place.

Handling Procedure

Management, field supervision, and purchasing officials, meeting early in the job, however, worked out a procedure for handling the slabs which cut erection costs by about six cents per square foot. First, the company selling the slabs was advised of the date the slabs would be required at the site, together with the sequence in which the slabs were to be used. The slabs were then shipped to the site by flatcar. Sections were bundled into groups of ten and banded with two steel straps, and these were loaded lengthwise on the car on 4 x 4 skids.

This method of shipment, entirely new to both the slab manufacturer and the railroad, created several problems. In order to conform with railroad regulations, a car-loading expert representing the railroad had to go into the slab manufacturer's plant to work out all the loading details. In addition, a representative of the steel strapping company had to be on hand to determine just how the slabs were to be bundled. Some additional costs entered the picture when the slab manufacturer had to load the material on flatcars rather than boxcars, but this was offset by the fact that the slabs could be loaded with a fork-lift truck, eliminating hand labor.

The same type of truck was also used to unload the slabs at the construction site, move them from the rail siding to the building, then raise them to the roof near the spot where they were to be installed. In this operation, also, a representative of the fork-lift truck company was called in to make recommendations on the right piece of equipment for the job. Here also economical selection and use of equipment helped save both time and money for the company.

When actual construction operations began, it was found that only about ten minutes was required to do the work, or about one minute

Reinforced precast-concrete slabs, bundled into groups of ten, are taken off a flat car by a Clark fork-lift truck which will take them to the construction site. Right . . .

. . . one of the slabs is put in place on the roof of du Pont's new addition to the Pompton Lakes plant. A studied plan cut the cost of placing each slab about six cents.

per slab from car to roof.

Trimming Costs

Savings similar to those effected on the du Pont job can be achieved by almost any contractor who carefully considers the unloading, storage, and movement of raw materials on a job. These factors are too often neglected, with the result that outmoded methods of getting materials to the various crafts are still in evidence, even on large-scale construction projects.

With the return of a very highly competitive buyer's market and the necessity of trimming costs, contractors will find material handling, representing from 20 to 80 per cent of all production costs, one of the best fields in which expenses can be kept to a minimum. Substantial savings can often be made by considering the four simple questions du Pont answered on this job.

The first is: What is the best method of shipment for the particular material?. Once this is answered, the contractor can consider whether the material can be used as soon as it is unloaded, or whether it must be stored and moved again. Third, if the material can be used immediately and more than one shipment is necessary, the contractor should turn his attention to whether the manufacturer has been notified to ship the material in the order in which it can be used. The final question to consider is whether or not adequate storage facilities are available if the material being shipped is not to be used upon receipt. THE END

New Plastic Pipe For Submersible Pumps

■ A plastic pipe for submersible pumps is offered by the Yardley Plastics Co., 142 Parsons Ave., Columbus 15, Ohio. The plastic pipe has a built-in suspension cable of stainless steel for added strength and protection.

Sub-du-it pipe simplifies installation of domestic submersible pumps, increases operating efficiency, and decreases the over-all cost of water delivered, according to the manufacturer. It is available with special brass fittings.

The manufacturer points out that since plastic is up to five times lighter than steel pipe, plastic pipe is easier to handle, and therefore cuts installation time and costs.

For further information write to the company, or use the Request Card at page 18. Circle No. 222.

At left, the American 750 as a 1½-yard shovel; above, handling a 2-yard dragline bucket.

Shaft Assemblies Are Easy To Remove On New 1½-Yard Shovel

■ A new 1½-yard shovel rigged for all-purpose work including crane, clamshell, dragline, shovel, and backhoe operations is announced by the American Hoist & Derrick Co., 63 S. Robert St., St. Paul 1, Minn. The machine's rated capacity as a crane is 35 tons, and it will handle a 2-yard clamshell or dragline and a 1½-yard backhoe.

Outstanding among the new features of the American 750 shovel are the single-purpose shaft assemblies, each of which can be removed without disturbing another. Swing clutch-shaft assembly, and the retract shaft and crowd shaft assembly are removed from above the machinery deck. The boom-hoist drumshaft assembly and boom-hoist clutch shaft are removed horizontally from the left side of the machine. A section of the walkway is removed for this purpose.

To facilitate assembly and disassembly while retaining maximum strength of the various shafts, multiple-tooth involute splines are used. This type of spline eliminates keyways or deep splining which often is the cause of shaft failure.

Air control is another feature of the new model. Clutches on the shovel are of a special contracting-band type. The manufacturer reports that the clutches never need to be adjusted for the life of the lining since air automatically makes all adjustments. Antifriction bearings in the brake linkage of this new machine reduce strain on the operator. It is estimated by the manufacturer that the combination of antifriction bearings and the air-controlled clutches reduces operating effort as much as 60 per cent.

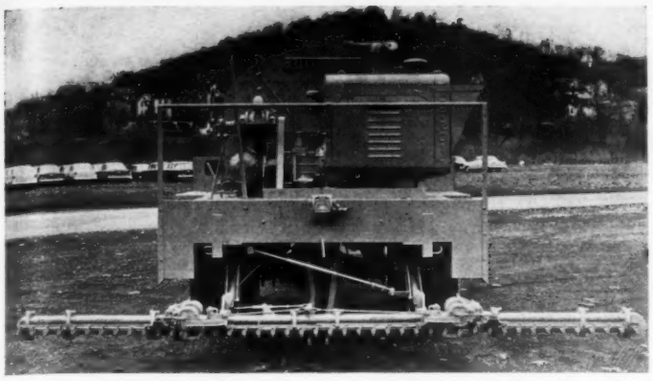
A simple machinery arrangement leaves the deck free for routine maintenance. Grease fittings, oil cups, and other lubricating devices are either banked centrally or located in easily seen places. The generous use of standard antifriction bearings throughout the machine reduces maintenance and makes for easier operation.

The travel mechanism on the new machine is of typical American heavy-duty design. The car body, roller path, and bull gear are integrated in one heavy steel casting. Bevel drive gears are enclosed and run in oil. Steering is accomplished by means of multiple jaw-type clutches. It is stressed that since there are no bands to soak or slip, these clutches continue to operate even when the crawler base is submerged in water.

The unit has alloy-steel double-wall crawler shoes. The crawler side frames slide in on axles for minimum road and rail clearances, or they can be removed along with the counterweight and front-end attachments to reduce load weights for over-the-road trailer hauling.

For further information write to the company, or use the Request Card at page 18. Circle No. 245.

Real wages in the United States—goods and services that can be bought with an hour's work—doubled in the 67 years ending with 1914, but took only 33 years to double again after 1914.



This new Littleford spraybar for bituminous distributors features simplicity of operation. The mechanically operated spraybar is available in widths up to 24 feet.

Mechanically Operated Distributor Spraybar

■ A new spraybar that simplifies the spraying of asphalt, tar, emulsion, road oils, and cutback is offered by Littleford Bros., Inc., 443-547 E. Pearl St., Cincinnati 2, Ohio. Designed for use on the Littleford Spray Master and Spray King bituminous distributors, the mechanically operated full - circulating spraybar is available in widths up to 24 feet. Simplicity of operation is a feature stressed by the manufacturer. Pulling a lever causes all nozzles to spray in unison, while pushing the same lever stops the spraying instantly with no drip.

Half the bar or any length of bar will spray. Each nozzle has an individual valve with the nozzles spaced on 4-inch centers. The mechanically operated bar gives double-lap spray.

Other features consist of end-folding, which is achieved by a cast hinged joint constructed to withstand road shock and free to move with little effort. A lock that holds the folded ends for traveling works automatically when raised. A coupling feature makes it possible to remove or add spraybar sections by loosening two bolts. The lightweight spraybar can be handled by one man.

For further information write to the company, or use the Request Card at page 18. Circle No. 193.

Steel Concrete Forms

■ Blaw-Knox steel forms for concrete construction are shown in literature recently released. The booklet describes a wide variety of form types and their uses, and more than 50 photographs illustrate the range of application.

The company's steel forms are shown in use on circular conduits, arched and box conduits, vehicular tunnels, and railway tunnels and subways. Illustrations also show their application in the construction of flood, retaining, and seawalls; circular tank and other walls for sewage disposal plants; caissons and shafts; dams, such as Bull Shoals and Hungry Horse; and as bridge centering for such concrete structures as the George Washington Memorial Bridge.

Included in the bulletin are practical design suggestions for the economical adaption of Blaw-Knox steel forms as well as recommended data to be included in any inquiries.

To obtain this literature write to the Blaw-Knox Co., Steel Forms Department, P. O. Box 1198, Pittsburgh 30, Pa., or use the Request Card at page 18. Circle No. 241.

"Well, I learned something about handling dynamite today."

Bituminous Mix Practices in States Are Compared

To Develop specifications for the bituminous concrete portion of the proposed AASHO Test Road in Illinois, questionnaires were submitted to all state highway departments to determine present practices in this type of construction. The specifications for the test road are to be based on the information obtained, and will be prepared in such a way that a truly representative pavement can be assured for testing. The response to the questionnaire was excellent, and W. E. Chastain, Sr., Illinois Division of Highways, presented the preliminary report at the recent meeting of the Highway Research Board in Washington, D. C.

Information was received on such items as (1) aggregates permitted and the tests controlling their use, (2) bituminous materials and tests, (3) methods used in the design of bituminous concrete mixtures, (4) criteria used in establishing the design of mixtures, (5) specification limits for mixture composition, (6) gradation of typical mixtures, (7) tests on completed mixtures, (8) methods and controls used at the plant producing the bituminous concrete mixtures, and (9) methods and controls exercised during placement of the material on the road. Information was also obtained on numerous items of lesser importance.

While isolated wide variances in mixture practice were expected and noted, a surprising uniformity was found in a number of major items.

Aggregates

A total of 30 reporting agencies do not have fine aggregate specifications. Of the 20 agencies reporting specifications for fine aggregates, all permit natural sand; 15 permit stone, sand or screenings; and 8 allow miscellaneous other materials, including chat, slag, and volcanic cinders. Fine aggregate gradation requirements vary widely, although most states use a top size of 0.187 inch (No. 4 sieve) and permit only a relatively small amount of material to pass the No. 200 sieve. Of the 20 agencies with fine aggregate specifications, 10 specify some form of soundness requirement.

With one exception, these 20 states also have separate specifications for coarse aggregate. Here again, while gradation limits vary widely, there was found to be some degree of relationship when the top sizes were taken into consideration. Most of the states specifying coarse aggregate separately have set up similar types of soundness and wear requirements.

Of the states not specifying fine and coarse aggregates separately, all have set up specifications for either the total aggregates or for the bituminous-aggregate mixture. These usually include gradation requirements and soundness and wear requirements for the aggregates. Gradation requirements for total aggregate were found to vary considerably, except for the top sizes.

The most popular types of mineral filler appear to be limestone dust and portland cement. A total of 40 states mention the use of some form of limestone dust, while 35 states mention a use of portland cement. Among the other types of filler mentioned by more than one state were fly ash and soil, each of which is used by four states. One state mentioned using diatomaceous earth, while another definitely prohibits its use. Most agencies require their mineral fillers to meet the gradation limits as specified by AASHO Designation M 17-42.

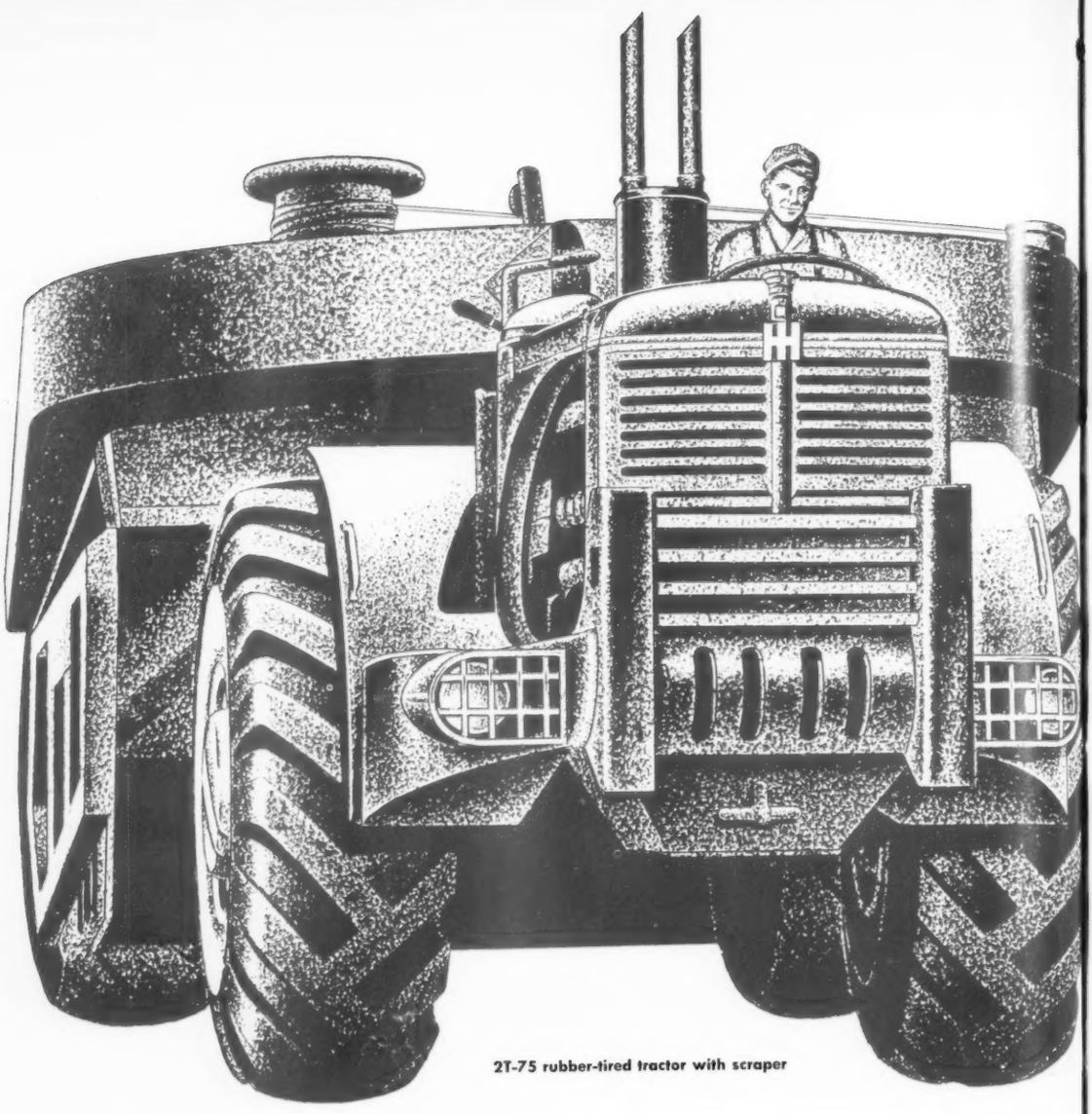
Asphalt

Tabulated data reveal that asphalt cement meeting ASTM's Designation D 946-47T, with a penetration between 85-100, is most commonly used. A few states, distinguishing between light and heavy traffic specify 60-70 penetration asphalt for pavements carrying heavy traffic. In addition to the several requirements of ASTM Designation D 946-47T, a few states mention specific gravity limitations, spot test requirements, and requirements for tests conducted on asphalt recovered from the mixture.

Mixture Composition

Among the most enlightening results obtained from the questionnaires were those concerned with the limit requirements of the composition of bituminous concrete mixtures. Because of the several ways in which the individual states specify and report these limits, a considerable amount of data conversion was required before a comparison could be made.

Two general methods of specifying mixture composition, with some variations, are in use. In one of these methods, the mineral aggregate requirements are specified as percentages either passing or re-



2T-75 rubber-tired tractor with scraper

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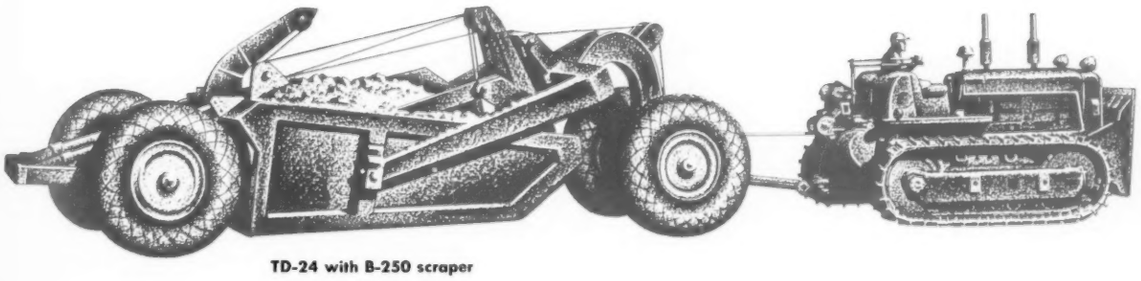

TD-24 with B-250 scraper

HOW TO BUILD A DAM FAST. INTERNATIONAL TD-24 crawler dozes and tamps with 4 massive sheepsfoot rollers in a single operation.

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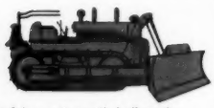
TD-24 crawler with matched scrapers

TD-18A crawler with matched scrapers



TD-24 crawler with bullgrader

TD-14A crawler with cable bullgrader

TD-9 crawler with hydraulic bulldozer

TD-9 tractor with front-end loader

TD-6 crawler with hydraulic bulldozer

TD-18A crawler with sideboom

Model 2T-75 two-wheel, rubber-tired tractor with 18 heaped-yard capacity scraper

Model 2T-75 two-wheel, rubber-tired tractor with 20 heaped-yard capacity bottom dump wagon

Model 2T-55 two-wheel, rubber-tired tractor with 13 heaped-yard capacity scraper

tained on individual sieves of a series. These percentages are based on the total dry weight of the aggregate. The bitumen content is then specified as a percentage of either the total aggregate or the total mixture.

By the second method, the requirements are specified as percentages passing one sieve and retained on the next smaller sieve. The percentages of mineral aggregate are based on either total aggregate or total mixture, including both aggregate and bitumen. The required amount of bitumen is based on either total aggregate or total mixture.

A recently proposed method of converting and plotting per cent passing and retained requirements to a per cent passing basis, as reported in the April, 1953, issue of *Public Roads*, was used to place the requirements of all reporting agencies on a uniform basis for comparison. The basis chosen listed aggregate requirements as per cents passing based on total aggregate, and bitumen requirements as per cents of the total mixture.

When all of the mixture requirement conversions were made, these converted limits were plotted for each state on semilogarithmic cross-section paper. As is commonly done, the percentage scale was placed on the vertical axis, and the sieve sizes were placed on the horizontal logarithmic axis.

Values for the amounts of material passing sieves other than those listed in the specifications were determined and tabulated from these graphs for the individual agencies.

After the limiting requirements had been plotted on a uniform basis, groups of envelopes controlled by the allowable top size of aggregate were formed. Per cents passing the various sieves were averaged in each group and an average envelope drawn for the group. Grouping of gradation envelopes for individual agencies produced three groups for surface course material and four groups for binder course material. The controlling top sizes for the surface course groups were: ⅜-inch to ½-inch, ½-inch to ¾-inch, and ¾-inch to 1-inch. For the binder course material, the controlling top sizes for the groups were ¾-inch, ¾-inch to 1-inch, 1-inch to 1¼-inch, and 1-inch to 1½-inch. The ½-inch to ¾-inch maximum size was most frequently used by the reporting agencies for surface course materials, and the ¾-inch to 1-inch maximum size was most frequently used for binder course materials.

The average surface course mixture gradation for ½ to ¾-inch maximum size aggregate was:

Sieve Size	Per Cent Passing (Per Cent of total aggregate)
¾-inch	100
½-inch	87–100
⅜-inch	72–92
No. 4	45–71
No. 10	30–55
No .20	23–46
No. 40	17–38
No. 80	9 –23
No. 200	4 –8
Asphalt 4.6–7.4 Per Cent (Per Cent of total mix)	

The average binder course mixture gradation for ¾ to 1-inch maximum size aggregate was:

Sieve Size	Per Cent Passing (Per Cent of total aggregate)
1 inch	100
¾-inch	91–100
½-inch	54–81
⅜-inch	43–73
No. 4	30–57
No. 10	19–43
No. 20	11–33
No. 40	7 –27
No. 80	3 –15
No. 200	1 –6
Asphalt 4.1–6.7 per cent (Per cent of total mix)	

Asphalt Content

Concerning asphalt contents, agreement between all agencies was, in general, quite close. Asphaltic contents for surface course material generally ranged between 4 and 8 per cent. For binder course material, it was generally between 3½ and 7 per cent.

As is to be expected, the maximum size of aggregate and the thickness of the lift of the mixture placed and compacted are interdependent. The ¾-inch to 1-inch top-size binder course material is usually placed in a lift of 1½-inch compacted thickness. The 1-inch to 1¼-inch top-size binder-course material is usually placed in lifts of 2-inch compacted thickness. Surface course mixtures of ½-inch to ¾-inch top size are most usually placed in lifts of 1½-inch compacted thickness.

Allowable Tolerances

The average allowable tolerances for 9 reporting agencies which used a surface course mixture with a maximum aggregate size of ¾-inch were:

Sieve Size	Per Cent Passing (Per Cent of) Total Aggregate	Tolerance (Per Cent)
¾-inch	100	
½-inch	93	±5
⅜-inch	84	±5
No. 4	57	±5
No. 10	41	±4
No. 40	27	±3
No. 80	13	±3
No. 200	5	±2
Asphalt 5.7 per cent (Per Cent of Total Mix)		±0.4

Preliminary job-mix formula re-

turns indicate that, like composition limit requirements, there is a considerable uniformity between states where the allowable top size of aggregate is taken into consideration.

Of 25 agencies reporting on the design of bituminous concrete mixtures, 10 make use of the Marshall test in their design procedure, 7 use the Hveem test, and 7 use the Hubbard-Field test. Other tests are used to a lesser extent. One state reports using the triaxial method, and another reports using an immersion-compression method. Several states report using two of the more common methods, while two states report using no formal mixture-design procedure.

Only a few states have thus far reported having definite design values. It is supposed that this is because such criteria are still in the development stage. Considerable variation exists in limiting values upon which mixture designs are based for the few states reporting such values. Some of the variations may result from differences in the amount of traffic that the compacted mixtures are expected to carry, although substantial differences exist even where the character of the traffic is taken into consideration in the design.

Equipment

Of 25 states thus far reporting on the type of asphalt plant specified, 23 permit either a batch-type plant or continuous plant. Two allow only a batch-type plant. Of the 23 that permit either type of plant, 12 report using the batch type more frequently. One state uses the continuous type more frequently, while the other states do no favor either type.

In the matter of rollers, 9 of the 25 reporting agencies specify a minimum of two rollers for each construction project. The other agencies specify no minimum number, but set roller requirements according to production. Six states require one tandem and one three-wheel roller as a minimum. Five states specify the use of tandem rollers only, and 12 states allow the use of either tandem or three-wheel rollers.

Another important subject for which returns are incomplete is that of pavement thickness. A minimum thickness of one inch is reported for both surface and binder courses, while a maximum of 3 inches has been reported for both courses where heavy traffic prevails. Base course thicknesses vary from 2 to 12 inches under medium traffic and from 2 to 21 inches under heavy traffic. Subbase courses vary from 3 to 24 inches under light traffic and from 5 to 36 inches under heavy traffic. Many factors, including subgrade support, climatic conditions, and traffic, determine total pavement thickness and account for the wide variations reported. Surface course and binder course thicknesses show much less variability than do base and subbase thicknesses. THE END

From a paper by W. E. Chastain, Sr., Engineer of Physical Research, Illinois Division of Highways, which was presented at the recent annual meeting of the Highway Research Board in Washington, D. C.

Bin-Level Indicators Are Pressure Actuated

■ A new catalog which describes and illustrates the company's line of pressure-actuated bin-level indicators is announced by the Bin-Dicator Co., 13946-54 Kercheval, Detroit 15, Mich. The indicators are described as simple, reliable, and inexpensive means of indicating the level of granular, pulverized, and semiliquid materials stored in tanks, silos, hoppers, and bins. If required, these units also actuate various types of signals such as horns, bells, or lights at the installation or at some remote point. The devices are also frequently used to start and stop loading and filling machinery, as required by the level of the material in the bin, silo, or chute.

All Bin-Dicator units operate through the pressure of the stored material against a flexible diaphragm linked to a simple counterweight. The indicators are said to be easy to install and maintain.

The new catalog supplies complete installation data for various types of units including thick or thin-walled bins in either inside or outside locations and suspended interior installations. New and improved models are available.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 239.

Heavy-Duty Model Of Excavator-Crane Has Improved Boom

■ Special heavy-duty equipment for the Bucyrus-Erie 22-B ¾-yard excavator-crane has been developed to widen safety-factor margins and to increase machine life on crane, clamshell, and dragline operations. The new heavy-duty 22-B, while basically the same machine as the standard model, has a number of additional features. They include a long-frame crawler mounting which provides increased bearing area for improved traction and better stability and maneuverability. In addition, a new heavy-duty boom with added weight and strength provides increased work load capacity.

When equipped for lifting-crane service, the heavy-duty 22-B carries boom lengths from 35 feet standard to 70 feet with removable inserts. Boom suspension is of the pendant type with eight parts of operating line between bridle and boom point. Available as extra equipment for booms 40 feet or longer is a 16-part suspension (8-part multiplied by additional 2-part) with pendants, providing slower boom hoisting or lowering for even greater precision control.

For increased ease, safety, and efficiency of operation, the improved lifting-crane offers power-controlled lowering on the main hoist line. In addition, hoisting and lowering of the boom is power controlled and fully independent of all other functions. With this combination, lowering control is said to be so accurate that loads can be inched into position. Other imporant safety features are a friction swing brake, in addition to the regular swing lock, and boom stops of the telescoping pipe type.

When equipped for dragline or clamshell work, the excavator carries booms ranging from 35 to 50 feet. Shovel and drag shovel front-ends are not offered with this machine, but are still furnished with the standard Bucyrus-Erie 22-B machine and the 22-B transit crane.

For further information write to the Bucyrus-Erie Co., Box 56, South Milwaukee, Wis., or use the Request Card at page 18. Circle No. 178.

The Bucyrus-Erie Model 22-B ¾-yard lifting crane is shown as a dragline feeding a hopper in a gravel pit.

Line of Diesel Engines

■ Five models of diesel engines ranging from 9 to 54 bhp are described in literature from the National Supply Co., Engine Division, Springfield, Ohio. The Lister stationary diesel engines are available in 1 to 6-cylinder models with 3.75-inch bore and 4.5-inch stroke. Design features, specifications, and dimensional diagrams are included.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 283.

This is the new Lima Model 703 SC, a 50-ton lifting crane. The standard boom for the unit is 50 feet long. The crawler width is 14 feet 2 inches, and the over-all crawler length is 18 feet 6 inches.

Lifting Crane Offered on Wheels or Crawlers

■ A new lifting crane, available either as a crawler or wheel-mounted unit, has been placed on the market by Baldwin-Lima-Hamilton Corp., Lima, Ohio. The new Lima Model 703 SC has been designed especially for crane work.

On crawlers, the unit has a lifting capacity of 50 tons at a 12-foot radius with a 50-foot boom. Its capacity is 1,995 pounds at a 110-foot radius with a 130-foot boom. The crawlers are 18 feet 6 inches in length and 14 feet 2 inches in width. The working weight is approximately 109,000 pounds.

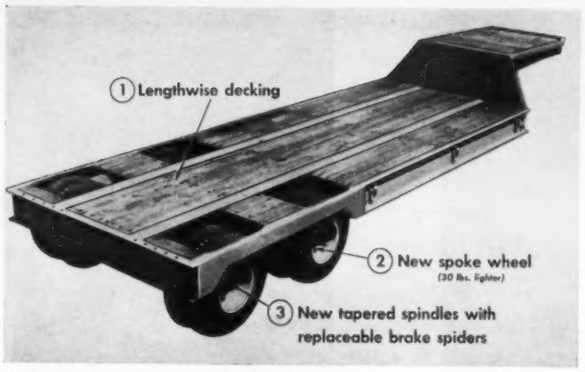
The crane is built so that the crawler side frames and counterweight segments can be removed when the machine travels over highways where weight must be kept within certain limitations. The unit acts as its own crane to remove or apply the side frames. Each side frame is secured to the axle by eight machined bolts.

The wheel-mounted version of the machine is the Model 703 SC-W. This self-propelled unit has one engine in the rotating assembly which supplies power for all operations. Power for propelling is transmitted from the standard reversing clutches in the rotating assembly through a special train of gears and the vertical propel shaft to the wheeled mounting. Only one operator is required.

The air-controlled Model 703 SC has twin hook-type conical rollers in front and a back-hitch gantry. It has a low center of gravity, since the main machinery is placed well back of the center of rotation, reducing the need for excess counterweight. The swing is controlled by a special three-way compensating valve which permits simultaneous operation of swing clutch and swing brake.

Optional equipment includes independent propel, a dual-drum boom hoist, an auxiliary or third drum, a torque-converter power takeoff, and an automatic boom stop.

For further information write to the company, or use the Request Card at page 18. Circle No. 209.



Lengthwise decking, new spoke wheels, and the use of tapered spindles with replaceable brake spiders are features of the latest LaCrosse low-bed trailers.

New Low-Bed Trailers Have Redesigned Decks

■ Three improvements for bettering the performance of its low-bed trailers have been announced by the LaCrosse Trailer Corp., 418 Gould St., LaCrosse, Wis. To provide more strength and durability in end-loading, all LaCrosse Model DF6T tandem-axle trailers are now being supplied with oak decking running parallel with the trailer length. The decking is also recessed into the trailer frame to give a lower loading height than formerly was possible with ordinary drop-platform trailers.

The deck of the new 20-ton DF6T with drop platform is 1½ inches lower than the earlier 20-ton model, equipped with a more expensive low-drop platform. The new 24-ton drop is only one inch higher than the former 24-ton low-drop. Thus, in most instances, the need of paying a premium for a low-drop deck has been eliminated.

LaCrosse engineers have also developed a new tapered automotive-type spindle with a bolt-on casting, which is said to permit quick low-cost replacement of brake spiders, without having to purchase or remove expensive welded axle assemblies. The load center of the wheels has also been moved in to utilize larger stock-size wheel bearings. Axles will continue to be heat-treated and cambered for minimum tire wear.

An improved spoke-type wheel design, with six individual rim lugs, is said to save approximately 30 pounds of useless dead weight per wheel in the new models, in addition to simplifying alignment of wheels and rims. Average total weight saving per trailer is 120 pounds. Wheel and hub are cast integral from the best grade of SAE 1030 steel. Although these latest improvements are currently available on only the 20 to 40-ton-capacity LaCrosse tandem models, the company reports they will soon be incorporated into its complete line of standard low-beds and tilting trailers from 6 to 67 tons capacity.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 303.

In 1837 the talk was not of deficits, but rather of surpluses, for in that year the Treasury disbursed $28 million of excess revenue to the states.

Clearing operations for the new approach road are started by a Caterpillar D7 and dozer. More than 27 acres of clearing and grubbing were included in this part of the contract held by L. G. Arnold, Inc., Eau Claire, Wis. *C&E Staff Photos*

One of the larger fallen trees is cut into sizes convenient for handling by a Mall Model 2HG chain saw. Smaller brush and branches were trimmed with axes, then piled and burned on the cleared right-of-way.

Approach Road Is Built on Steep River Bank

STEEP AND NARROW ROADS, with grades exceeding 15 per cent and roadways scarcely wide enough for two automobiles, form the approaches to an old swing bridge over the St. Croix River at Osceola, Wis. The bridge is rusted and fragile looking and has been restricted to light loads for many years. Its swing section—pier and all—leans downstream at a noticeable angle. In this beautiful old river valley, the span is picturesque—but it can hardly be considered practical.

All this will soon be a thing of the past. About 200 feet downstream from the old span, a new bridge is under construction together with new approach roads having flatter grades, longer curves, and wider roadways. One approach road, while on an entirely new alignment, has one long curve which crosses the old roadway.

The project actually had its start in 1951, when the state of Minnesota, by legislative action, took over the mile-long west approach road which connects with Minnesota Trunk Highway 95. Wisconsin and Minnesota then entered into a joint agreement to build the new bridge and grade new approach roads. Late this summer both projects will be completed and the two states linked by a modern highway that will be safe for motorists, economical to maintain, and pleasing to see and to travel on.

Designed by the Minnesota Department of Highways, the project will have a finished 36-foot bituminous surfaced roadway on a 3-inch stabilized gravel base, with stabilized gravel shoulders on both sides. Good gravel material found in the cuts was used in the top foot of the roadway grading section.

Where possible, side slopes are 4 to 1, then going to a maximum of 2 to 1. The rounded bottoms of the wide ditches are sodded, as are the

Heavy grubbing, clearing, and excavation are required for 1.2-mile road connecting highway and new bridge

The loading cycle starts as a Super-C Tournapull, pushed and pulled by Allis-Chalmers HD-19 tractors, gets ready to start the downhill run to the fill area. These machines were used to make the longer hauls on the grading project.

top edges of the roadway, and the other slope areas are seeded.

Maximum grades are 5 per cent, with long horizontal and vertical curves providing the utmost in safety and sight distance. The design speed basis is 50 miles an hour.

The approach on the Minnesota side resembles a mountain grading job, both in appearance and in quantity of excavation. Cuts range up to 57 feet in depth, and the depth of fills exceeds 30 feet. In the 1.2 miles of work there were some 260,000 cubic yards of excavation. All the cuts were at the top of the hill and all the fills at the bottom, making the average haul about half a mile.

Clearing and Grubbing

Since the area was heavily wooded and many trees exceeded 12 inches in diameter, a great deal of clearing and grubbing was required before earth-moving operations started. The contract quantities included 27.1 acres of clearing and grubbing. The contractor, L. G. Arnold, Inc., Eau Claire, Wis., used mechanical equipment to good advantage on this phase of the work. A Caterpillar D7 and dozer pushed over most of the trees and grubbed out the stumps. Smaller brush and branches were trimmed by a crew of men with axes, then piled and burned on the cleared right-of-way. Two men with Mall 5-hp and Homelite 4-hp chain saws cut the larger trees into pieces which could be piled easily.

A Caterpillar D8 helped to drag stumps off the right-of-way and piled them at points specified by the owner of the adjacent land. At one point, a ravine was filled with stumps and large stone. The landowner also designated points where logs suitable for lumber or firewood could be piled.

With brush, trees, and stumps removed, a Caterpillar dozed the topsoil into piles along both sides of the right-of-way, exposing the subsoil material—clay and gravel running to large rocks. Scrapers and Tournapulls then moved in to load and move the material.

Clearing operations were started May 15, 1953, earthwork was started about ten days later, and the grading project was completed and ready for surfacing under a separate contract early in August.

To meet this grading completion

(Continued on next page)

A Tournapull stops at the GMC lubrication van for servicing on the St. Croix River bridge project. The completely equipped van, located near the center of the project, intercepted each piece of equipment on the job at least once a day for checking and lubrication. *C&E Staff Photo*

(Continued from preceding page)

date on the first of August, Arnold moved in a spread of equipment matched to job conditions and geared to the work schedule. For the shorter hauls, five Caterpillar D8 tractors with LeTourneau FP and W scrapers loaded the clay and gravel materials. An International TD-24 and a Caterpillar D8 served as pushers. In addition to the clay and gravel material—which contained large stones—the excavation also included about 36,000 cubic yards of rock. This material was gouged from a sandstone ledge exposure on a side hill cut. Here the D8, in addition to assisting in the loading operation, also ripped up the sandstone with a LeTourneau K30 ripper.

On the longer hauls, six Super-C Tournapulls carried the material down the hill rapidly. Two Allis-Chalmers HD-19 tractors, one pushing and one pulling, assisted the Tournapulls in the loading cycle.

Both HD-19's were equipped with front push plates and heavy cable tow lines so that either machine could push or pull. Operators maneuvered quickly from a loaded scraper to the next empty, taking advantage of every opportunity to save precious minutes. A laborer attached the cable to the Tournapull's hook. Since all the loading runs started in the same general area, this man was able to attach cables without causing any equipment delay.

Fill Swamp Areas

On the fills, a Caterpillar D7 assisted in spreading and leveling the material. Since parts of the fill area were swampy and crossed by several ponds, it was necessary to build the embankment out from the shore side by dumping the scrapers and Tournapulls as close as possible to the end of the fill. Turning on the soft narrow fill as they dumped was a difficult operation for the machines. Frequently they required assistance from the dozer, and this was the cause of a number of delays.

As the D7 dozed the materials over the end of the fill into the water, the shallow layer of muck was forced out ahead and to the side, leaving the new fill resting on solid subgrade.

Although the tractor-scrapers were normally used on short hauls and the Tournapulls on the longer hauls, there were times, as when CONTRACTORS AND ENGINEERS visited the job, when both types of equip-

ment were loading and dumping at the same points. Here the haul was about 1,600 feet, and practically the entire road ran down a grade averaging 6 or 7 per cent.

The average time required for the tractor-scrapers to make the round trip came to about 19 minutes, while the Tournapulls took 20 minutes to make the run. On both the loaded haul downgrade and on the empty run upgrade, the Tournapulls easily passed the tractors but were more frequently delayed in the difficult unloading and turning maneuver. The Tournapulls also spent more time on the loading cycle, some of it waiting for pushers.

As the length of the haul increased, however, the advantage went to the higher speed rubber-tired machines. This was particularly evident where the fills were in firm natural ground and the unloading operation could be done on a straight-through pass. On the long hauls—some of which were more than 4,000 feet—rubber-tired equipment was used exclusively.

In order that the machines could move without any delay, a Caterpillar No. 12 motor grader maintained the steep haul roads. These roads were unusually wide so that Tournapulls could pass tractors going in the same direction as well as the machines on the other leg of the trip.

Equipment Lubrication

A wide shelf on the hillside near the center of the job provided a level spot for Arnold's lubrication and repair setup. Here a completely equipped lubrication van intercepted each piece of equipment for checking and lubrication at least once a day.

The Alemite system in the van included four hose reels, each connected to its source of supply. In addition to the usual reels for transmission grease, pressure grease, and compressed air, the system also dispensed motor oil directly from a drum to the engines. The operator measured the amount of oil supplied to a machine by counting the number of strokes made by the air-operated barrel pump.

The lube truck also carried a 13 amp 120-volt Master generator, driven by a Wisconsin air-cooled engine, which supplied power for illumination during night repair and lubrication work. The generator also operated an Ingersoll-Rand electric wrench.

This entire setup was mounted on a 1½-ton four-wheel-drive GMC truck which could travel over the haul roads when necessary. One man worked fulltime on this operation.

Gas and electric welding equipment and tools located at the lubrication site were convenient for the mechanic making the needed field inspections and repairs.

Drainage

The new roadway intercepts several ravines which carry a relatively large runoff and required more than 900 feet of culvert. The pipes, varying in size from 18 to 60 inches, included one 40-foot-long cattle pass. Arnold used a Tournacrane operated by a Caterpillar D8 tractor to place some of the larger sizes of corrugated pipe used on the job. The crane, having a 30-foot boom and an 8-foot jib, proved to be useful for other lifting jobs, and it handled heavy parts during equipment repair and overhaul operations.

Quantities and Personnel

For a job only 1.2 miles long and having only a 36-foot-wide roadway section, the quantities involved were unusual:

Excavation (earth)	228,656	cu. yds.
Excavation (rock)	36,332	cu. yds.
Clear and grub	27.1	acres
Seeding	17	acres
Sodding	12,075	sq. yds.
Mulching material	3	tons
Culverts (18 inches to 60 inches)	864	lin. ft.

The entire job was handled by a crew of about 30 men. Phil Dudenhoefer was project superintendent for L. G. Arnold, Inc., and George Russell was project engineer for the Minnesota Department of Highways.

THE END

Rubber Blades Offered For Mortar Mixers

■ Rubber blades are now offered for the plaster and mortar mixers made by the Muller Machinery Co., Inc., Metuchen, N. J. The blades are mounted in place of the standard steel scraper blades and are adjustable for wear.

The advantage of a rubber blade over a steel one lies in the wiping action which keeps the drum shell clean and free of accumulations of plaster or mortar. The rubber blade also permits the by-passing of small stones which often cause blade breakage. The company manufactures the mixers in models ranging from 2 to 9 cubic feet in capacity.

For further information write to the company, or use the Request Card at page 18. Circle No. 261.

Asphalt Vs. Concrete On Road Surfaces

Indiana test road will carry normal highway traffic, allowing comparison of maintenance costs and durability

DURING ITS 1951 session, the Legislature of the state of Indiana adopted a resolution authorizing the State Highway Commission "to conduct adequate and conclusive tests" of both cement and bituminous pavements to determine the "durability, lasting qualities under heavy truck and auto traffic, and relative costs of initial application and general upkeep of each." The test sections completed last fall represent the first step in carrying out this authorization.

For the test, the State Highway Commission selected a heavily traveled section of U.S. 31 northwest of Columbus in which the old two-lane highway was being remodeled into a modern divided highway. Some parts of the old road were salvaged, resurfaced with bituminous surfacing, and used for one roadway of the new highway. One completely new roadway was added.

The test section, 10.4 miles long, was divided into two approximately equal parts. The southern half was designated as bituminous concrete paving and the northern half, as portland-cement concrete paving. The sections are directly connected and carry about the same type and amount of traffic.

Grading for both sections was done under a contract let in 1950 and completed in May, 1952. Soil tests taken after grading was completed showed no appreciable difference in soil types encountered in the subgrade.

Design Recommendations

Complete design data was submitted to the Portland Cement Association and The Asphalt Institute with the request that they submit recommendations as to the design and construction of the respective sections. With few exceptions, their recommendations were incorporated into the final designs for the road.

When plans were complete, the work was scheduled and advertised as a regular part of the department's construction program. The Bontrager Construction Co., Elkhart, Ind., was awarded the contract for the concrete portion, and the Rieth-Riley Construction Co., Goshen, Ind., was given the contract for the bituminous section. Construction articles on both the concrete and bituminous section will be found on pages 82 and 86, respectively, in this issue.

By including the work as part of the regular Federal-Aid program, there was no appreciable extra cost to the people of Indiana for the test road. In order to have complete reports and a detailed analysis of all materials used in the construction and to be assured of precise control of the operations, it was necessary for the state to do considerably more testing work than would normally be required. This naturally represents an increase in total project costs.

Conclusions

Before final cost reports are prepared, it is not possible to compare accurately the two types, even on the basis of initial cost. Analysis of the bid prices, however, indicates that the concrete pavement was bid at about $5 per square yard, while the bituminous pavement was bid at approximately $5.50.

While final conclusions must await years of service, there are some facts already evident: test roads need not be an extraordinary expense, they can and should be built by highway departments, and to show valid conclusions they must be built in large numbers under all types of soil and traffic conditions.

The results of the Indiana test will be cumulative and will not be available for many years. To be sure that the results are properly observed and records carefully kept, a Test Road Survey Committee has been set up. This committee is required to make a complete investigation and written report as soon as the pavement is opened to traffic. It must make a supplementary report annually thereafter.

To make certain maintenance costs are accurately kept, special cost account numbers have been assigned to both sections for all types of main-

tenance work. An annual report on these costs will be submitted concurrently with the report of the survey committee.

Qualifications

To provide usable information, other test sections must be set up. This road will yield only data covering one type of soil, one set of weather conditions, and one type of traffic load. Other test roads with variations on these three factors must be evaluated in order to obtain any conclusive information.

Also, it is obvious that special care has gone into the design and construction of the two sections. It is highly possible that they are so well-designed they will show no idications of major failure for many years. Meanwhile, other methods and new developments may come upon the scene, draining the importance of any conclusions made about these sections. This would indicate that much valuable information can be obtained from test roads less expensively built—roads which more closely simulate the average highway construction job.

THE END

Data on Concrete Vibrator

■ A catalog that deals with the Maginniss Hi-Lectric Magic Head concrete vibrator has been announced by the Maginniss Power Tool Co., 129 Distl Ave., Mansfield, Ohio. The booklet is available to all contractors and engineers.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 235.

The new 10-ton model of the Miller Tilt-Top trailer has a heavy-duty mounting.

New Tilt-Top Trailer Has 10-Ton Capacity

■ A new 10-ton capacity tandem-axle trailer with tilting top is announced by Miller Research Engineers, 428 S. 92nd St., Milwaukee 14, Wis. The new Tilt-Top trailer is of heavy construction and uses tapered side channels in the frame that are 14½ inches deep at center. The platform's rear edge, the tongue gooseneck, and the wheel assembly walking beam are all of box-section construction.

The walking beam member in the tandem-axle wheel assembly is one of the features of this new trailer. A heavy box-section beam on each side of the frame pivots independently on a 4¼-inch solid steel stub shaft projecting through the frame's side. The walking beam proper carries oversize 3⅜-inch-diameter stub axles at each end for the wheels. This design is said to provide better support for heavy loads, and permits the tandem wheels on each side to rise and fall independently over uneven terrain, thus reducing jarring.

Another innovation is an adjusting pintle eye on the tongue gooseneck, enabling the user to set it for the height of his particular truck hitch.

The platform deck is planked with 2-inch oak. It is 76 inches wide, 16 feet long, and has a low 25-inch height at level position. This low height not only reduces the over-all height of the load, but also lowers the center of gravity for safer trailing both on turns and in straight-away runs. In addition, the climb angle of the platform is greatly reduced for loading.

This platform size and weight capacity, the manufacturer states, enables the Model BT-10 to handle such crawler tractors as the Caterpillar D4 and the Allis-Chalmers HD-5, as well as rollers up to ten tons. The over-all trailer width is 8 feet. Gross weight unloaded is 3,800 pounds.

The new model BT-10 is equipped with platform deck, four 8:25 x 20 x 12-ply tires, two sets of 15 x 3-inch Warner electric brakes, lights, reflectors, and safety chains.

For further information write to the company, or use the Request Card at page 18. Circle No. 224.

Crane-Weight Indicator

■ A bulletin on its Type S-6 crane weight indicator is available from the Martin-Decker Corp., Long Beach, Calif. The device is used on boom cranes, bridge cranes, or overhead hoists having capacities up to 50,000 pounds. The literature describes the crane weight indicator and has photos and engineering drawings that show how the unit works.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 277.

Cement and aggregates are transferred from Ford batch trucks to the two MultiFoote 34E pavers which worked in tandem on the paving job. In the foreground, 1-inch round transfer dowels mark the place where a construction joint will be located.

C&E Staff Photo

Test Road Is Paved With 9-Inch Concrete

A 9-INCH reinforced-concrete slab on a stabilized gravel base forms the portland-cement section of Indiana's test road project. Portions of the 5-mile section of U. S. 31 between Columbus and Franklin in central Indiana, immediately north of the bituminous test section, were designed and constructed according to recommendations made by the Portland Cement Association.

In the 5-mile section of new divided highway, approximately 70 per cent is new pavement. This is the test portion. The remaining 30 per cent is the old pavement, resurfaced with bituminous concrete. General contractor for the project was the Bontrager Construction Co., Elkhart, Ind.

Grading had been done under a separate contract the previous year, and the grade was left slightly high. A Caterpillar D8 tractor with LeTourneau scraper and a Tournapull Roadster shaved the material down to proper grade, and a Caterpillar No. 12 motor grader shaped the finished section. This material was then rolled with a 10-ton Galion roller to obtain about 95 per cent dry density.

Preparing the Base

On this compacted subgrade, a clay-stabilized gravel lift 5 to 6 inches in compacted thickness was placed. This course was 26 feet wide, 2 feet wider than the concrete pavement, and was placed in two lifts. Each lift was compacted with the 10-ton three-wheel roller to obtain a minimum of 95 per cent dry density.

Metaforms were then set to line and grade for the pavement and tamped in place with a Cleveland mechanical form tamper. During most of the construction period, the contractor had 3,600 road feet of forms in use. The self-propelled Flynn Surgrader, riding on the forms, brought the base to approximate grade, removing excess material to the shoulders with its belt conveyors.

Precise grading was done with a Carr trail planer pulled by an Allis-Chalmers HD-5 tractor. The finished base was rolled with a 10-ton Huber roller and thoroughly wet down with a hand-held hose.

Ladder-like chairs for supporting the dowel bars at transverse joints were placed on the base ahead of the paving. Dowels 1 inch in diameter and 20 inches long were placed on 12-inch centers in all transverse or contraction joints. Along the cen-

A self-propelled Felker Di-Met concrete saw cuts a longitudinal center joint in the road about two weeks after paving operations are completed. The saw, running under its own power, leaves the operator free to service the machine and move the 260-gallon water tank.

Working close together in the paving operation are a Blaw-Knox spreader, followed by a Jaeger-Lakewood finisher and a Koehring longitudinal finisher. Behind these machines, a burlap cover is placed over the fresh concrete.

ter line were ½-inch tie bars 30 inches long, spaced 30 inches apart. A reinforcing mesh of No. 2 wire, weighing 54 pounds per 100 square feet, was placed in the concrete 2 inches below the finished surface.

Two Pavers Used

Concrete was mixed and placed by two MultiFoote 34-E single-drum pavers traveling in tandem on one shoulder. Cement and aggregates were proportioned in a batch plant and hauled to the pavers in trucks which carried three batches each. Water was supplied from a 1,500-gallon tank on a truck which stayed with the pavers. This vehicle was refilled by a second truck with a 1,000-gallon tank.

As the concrete was laid on the base, a Blaw-Knox spreader cut

(Continued on next page)

Sand is weighed into a Ford batch truck from the single-compartment 50-ton Butler bin. Two sizes of coarse aggregate used in the test road project are batched from the Butler bin in the background. *C&E Staff Photos*

(Continued from preceding page)

it to proper grade for the reinforcing mat. When the mat was placed, the balance of the concrete was poured and spread to finish grade by the spreader. A Jaeger-Lakewood finisher and a Koehring longitudinal finisher handled the finishing operations.

Transverse joints were cut in the fresh concrete at 40-foot intervals by a cutting bar mounted on the finisher. A Jackson vibrator attached to the cutting bar, and powered by a Kohler generator mounted on the finisher, helped to make the cut with a minimum displacement of coarse aggregate. After the joint had been cut, a ½ x 3-inch steel plate was inserted into the cut and left there until the finishing operations had been completed.

Permanent Center-Line Marker

A rolling bridge with hand-propelled belt belted the surface, after which a final finish was applied with hand brooms. The last operation before applying the burlap for curing was the installation of the permanent black center-line marker. A rolling bridge carried a long narrow guide just the width of the desired center stripe. When the bridge was rolled into place, this guide was lowered to the surface of the concrete. Within the guide, a workman roughened the surface of the slab and applied a black mineral oxide powder. He then troweled the powder into the concrete, making a relatively permanent marker which penetrates at least ⅛ inch into the concrete.

Burlap for curing was applied as soon as possible after the concrete had been finished and was kept wet until the next day. It was then replaced with straw which was kept wet three more days, giving a total cure of at least 96 hours.

Saw Center Joint

Within two or three weeks after the pour, the longitudinal joint was sawed using a Felker Di-Met concrete saw. Propelled by its engine through a friction drive, the saw moved along as it cut, leaving the operator free to observe the operation and service the machine. Water for the saw was supplied from a 260-gallon water tank on an accompanying truck. The saw was also run through the transverse joints to remove any concrete or pieces of aggregate which might have fallen into the crevice after the joint plate was removed. Presstite joint compound was applied to the joints without heating by use of a special Alemite pressure gun.

Batching of aggregates was handled through two Butler bins each having a capacity of 50 tons. The coarse-aggregate bin was divided into two compartments for the two sizes of aggregate. The larger size (No. 2) was a crushed limestone supplied by the Ohio & Indiana Stone Corp., Greencastle, Ind. The smaller size (No. 5) was a washed crushed gravel furnished by E. T. Burnside, Shelbyville, Ind. Aggregate bins were charged by a Northwest crane using an Owen 2¼-yard clamshell bucket.

Cement was handled in bulk by a Butler plant with a storage capacity of 700 barrels. Covered dump trucks hauled the bulk cement 72 miles from the plant of the Louisville Cement Corp. at Speeds, Ind.

Enclosed cement containers on the batch trucks received the cement from the scale hopper through a flexible tube. Gates in the bottom of the container opened to discharge the cement as each batch was dumped from the truck. Dust nuisance as well as loss of cement by blowing from the loads were almost completely eliminated.

The concrete mix contained six sacks per cubic yard of air-entrained cement. Aggregates were proportioned 35 per cent sand to 39 per cent small stone and 26 per cent coarse stone. Water-cement ratio was maintained between 4½ and 5 gallons per sack. Entrained air ranged from 3 to 5 per cent, and slump averaged 2½ to 3 inches. Seven-day beam tests showed an average strength of 600 psi.

Actual paving started June 5, 1953. In one month, one lane had been completed for the full 5 miles with the exception of a few short sections which were omitted to accommodate cross traffic. When the traffic could be carried over the new slab, one paver then moved back to fill in the missing spaces.

In addition to the concrete paving, Bontrager's contract included the refinishing of shoulders and ditches and the sodding and mulch seeding of a considerable area. The only specification for shoulder material was that the top 9 inches of material on the outer shoulder have a plasticity index of 10 or less (considering only the minus 40 material) and a volume change of 14 per cent or less. While this did not sound difficult to meet, a careful selection of the available soil was required to satisfy the specification.

Resurfacing portions of the old pavement which were not removed was also a part of this contract. Approximately 8,000 tons of hot-mix bituminous binder and surfacing material was laid on the three single-lane miles of resurfacing. Two binder courses, 1¼ and 1 inch in thickness, were followed by a 1-inch surface course.

Personnel

Project engineer for the Indiana Highway Commission was Paul Gibson. Assistant project engineers were James Kane and W. B. Colwell. As with the bituminous test section, an unusual amount of testing and inspection was provided by the highway department in order that records might be complete and no questions concerning the road's construction left unanswered.

Carl Moore was general superintendent for the Bontrager Construction Co., and John Moore was job superintendent. Walter Oram represented the Portland Cement Association on the project. THE END

Rubber-Base Compound For Expansion Joints

■ A new rubber compound that cures into a watertight expansion joint is announced by the Products Research Co., 3126 Los Feliz Blvd., Los Angeles 39, Calif. Uses for the new Thiokol-base compound have been found in concrete repair work, as well as in original construction. It is recommended for use wherever expansion, contraction, or vibration requires joint resilience, and it can be used in conjunction with a water seal.

The material, PR-395-HT, is used with PR-1090 primer and is said to achieve strong bond to most materials. The primer forms a deep waterproof barrier that prevents migration of moisture to the sealed surface.

Application of the rubber compound is done with a spatula or with an extrusion gun. It has a nonsagging consistency and will hold its position on vertical and overhead installations. A companion product, PR-395, of lower viscosity, is available for pouring into floor and other horizontal-type joints.

For further information write to the company, or use the Request Card at page 18. Circle No. 223.

Tractor Service Manual

■ A new manual that illustrates approved methods of doing many service operations normally encountered in servicing and repairing International farm tractors has been released by the Owatonna Tool Co., 381 Cedar St., Owatonna, Minn. Instructions for removing and installing gears, bearings, pulleys, shafts, precombustion cups, cylinder sleeves, and injection nozzles are contained in this manual.

In addition, complete tool sets, both manually and hydraulically operated for special maintenance operations, are included. This manual is part of the International 5 Star Service Program featuring approved tools and equipment.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 270.

DC Welder Announced

■ A new 400-amp, three-phase, dc, rectifier-type welder with a 60 per cent duty cycle has been announced by the General Electric Co., Welding Department, Schenectady 5, N. Y.

Designated as G-E Type WR4OA, the new welder can be equipped to operate on two-phase power and has a current welding range of 70 to 500 amp. It can be utilized with a variety of electrode sizes for repair, maintenance, and construction work.

According to the company, the selenium rectifier welder makes it easy for operators to achieve current adjustments by means of a stepless current control. Quiet operation is a feature of the welder, and maintenance is simplified since the unit's side pieces are easily removed.

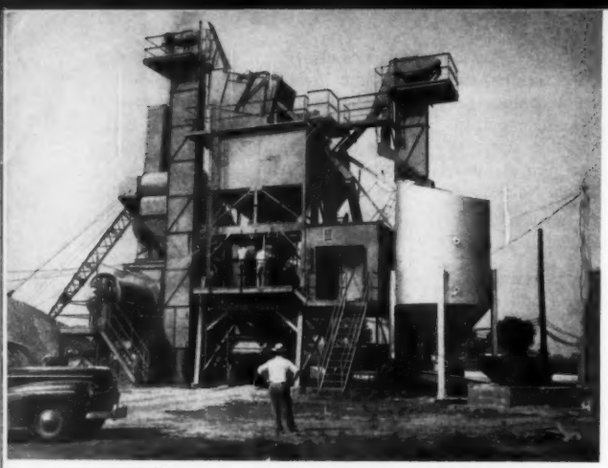
For further information write to the company, or use the Request Card at page 18. Circle No. 225.

Power Shovels and Cranes

■ A new bulletin covers the crawler-mounted power shovels and cranes in the 1-yard Lorain 50 Series. A feature of the line discussed is the use of direct power from the engine through a center drive pinion to the independently clutch - controlled hoist and swing-travel shafts. Details are also given on the air controls for hoist, crowd, retract and drag actions; the hydraulic coupling which prevents stalling and shock in shovel operations; and the precision boom-lowering device and power-load lowering for crane work.

There are on-the-job photos of the units working as cranes, shovels, hoes, clamshells, and draglines. Sections are devoted to each of these five interchangeable front-ends, with data on accessory equipment.

To obtain this literature write to The Thew Shovel Co., 28th St. and Fulton Road, Lorain, Ohio, or use the Request Card at page 18. Circle No. 305.



A new Hetherington & Berner asphalt plant with 5,000-pound pugmill capacity mixes materials at the paving site. The plant is electrically operated and has hydraulic controls. The tank at right stores mineral filler. *C&E Staff Photo*

Bituminous Test Road Built on Macadam Base

8-inch waterbound layer applied in single course on sandy subbase; supports 5-inch asphaltic concrete pavement

THE BITUMINOUS section of Indiana's recently completed test road is a 5-mile stretch of divided highway just north of Columbus, Ind., on U. S. 31. Designed and built in accordance with recommendations of The Asphalt Institute, the project was a part of the regular construction program of the Indiana State Highway Department. Contractor for this section was the Rieth-Riley Construction Co., Goshen, Ind.

The design is essentially a waterbound macadam base laid down on a compacted granular subbase and topped with approximately 5 inches of hot-mix bituminous surfacing applied in three courses. The typical section consists of two roadways—each 24 feet wide—with shoulders 10 feet wide on both sides. A depressed median 50 feet wide separates the roadways.

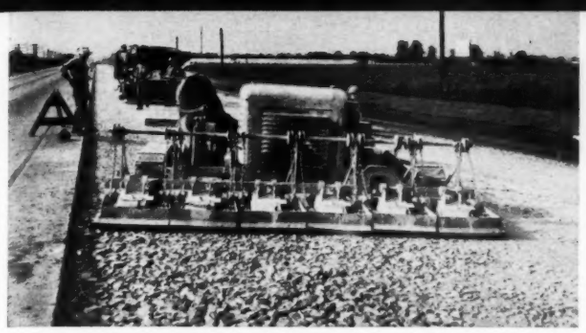
Throughout most of the project, one of the roadways consists of the old pavement, widened and resurfaced in some areas and completely replaced in others. Although built under the same contract, the resurfaced old pavement is not a part of the test section. Grading and drainage had been constructed under a separate contract awarded in 1950 and completed in 1952.

Subgrade and Subbase

As the roadway was left high in the center by the grading contract, it was necessary for the contractor first of all to remove some of this material. A Caterpillar No. 12 motor grader equipped with a Domor elevator transferred material from the roadway to the shoulders and loaded the excess into trucks. A Caterpillar D8 tractor with dozer, an Allis-Chalmers HD-5 tractor with front-end loader, and a Caterpillar No. 112 motor grader also were used in grading the roadway and building the shoulders.

Another preliminary operation was the installation of a 6-inch drain to assist in subgrade drainage in some areas. A Cleveland trenching machine dug approximately 3,000 feet of trench about 2 feet below subgrade level for the installation of the drain tile. Trenches were backfilled with granular material.

Compaction of the subgrade to 100 per cent dry density (Proctor) was then accomplished by rolling with three-wheel 10-ton Huber rollers. Additional compaction was then applied with a Ferguson rubber-tire roller ballasted to weigh from 20 to 35 tons. Tests indicated no appreciable increase in density with the use of the heavy roller.



A Vibro-Tamper shakes limestone screenings down into the coarse rock of the macadam base for this Indiana test road.

Screenings for a choker layer are laid down by a Burch spreader pulled by an International dump truck. Rieth-Riley Construction Co., Goshen, Ind., had the contract with the Indiana State Highway Commission.

On this compacted subgrade, a layer of sandy subbase material was placed. The course was 5 inches thick at the high side of the roadway, 8 inches thick at the lower side, and 27 feet wide. The subbase was placed in two applications, each of which was watered and compacted to 100 per cent dry density by the three-wheel rollers. This permeable layer extended through the outside shoulder in full sections to provide drainage; in cut sections, drainage was provided by the 6-inch drain.

An application of limestone screenings was added to the subbase at the rate of about 70 pounds per square yard. Seaman Pulvi-Mixers worked the screenings into the top 2 or 2½ inches of subbase to provide a more stable working surface. This surface was compacted with vibrating compactors to at least 100 per cent dry density. Attempts to compact the material further with the big Ferguson roller were unsuccessful, as the kneading action of the heavy pneumatic tires disturbed and displaced the sandy material beneath.

Water-Bound Macadam

The next step was the placing of the 8-inch compacted course of macadam. Limestone screenings applied at the rate of 100 pounds per square yard formed an inverted choke. A Burch tailgate spreader distributed the material from dump trucks, making two or more applications in laying down the heavy course of loose screenings.

Coarse rock for the macadam was applied in a single course 10¾ inches deep in the loose condition and later compacted to 8 inches. An Apsco spreader placed the material in two lanes, each 13 feet 1 inch wide, for a total width of 26 feet 2 inches. The rock was crushed limestone screened so that 100 per cent passed the 4-inch screen and 95 to 100 per cent was retained on the ¾-inch screen.

Compaction and keying of the rock were accomplished with the use of a Vibro-Tamper, together with Huber three-wheel and tandem rollers. The Vibro-Tamper consists of a series of vibrating shoes, the six units making a total width of 13 feet. The machine is mounted on tracks and is self-propelled. The rock course was vibrated and rolled until it was compacted to grade and the maximum keying action of the large rock obtained before application of the choker. The rock course was also carefully straightened and corrected where necessary to produce a smooth surface.

Originally it had been planned to apply as much as 274 pounds per square yard of limestone screenings for choker. Experience showed, however, that not more than 140 pounds could be absorbed into the voids of the rock. Four applications of 35 pounds per square yard were found to give best results. After each of the first three applications of screenings, the Vibro-Tamper made several passes over the area, working the fines into the rock.

The fourth application was given a single pass with the Vibro-Tamper, then rolled and broomed with a 3-wheel Huber roller and a wire push

(*Continued on next page*)

The macadam base is primed with MC-1 by this 2,000-gallon Etnyre distributor pulled by a Model 450 GMC truck. The primer was applied at the approximate rate of 0.25 gallon per square yard. *C&E Staff Photo*

(Continued from preceding page)

broom attached to the rear of the roller. Finally, the entire surface was rolled with the Ferguson rubber-tire roller ballasted to weigh from 30 to 50 tons.

Water-binding followed, with four 1,000-gallon-capacity tank trucks equipped with pumps and spraybars supplying the water. Rolling with a tandem and a pair of three-wheel rollers continued until the voids were filled. When dry, the course resembled a somewhat rough concrete slab in appearance and hardness.

Bituminous Surfacing

After about a week, when the base had dried thoroughly, the course was swept clean with a Littleford power broom pulled by a Ford tractor. An Etnyre 2,000-gallon distributor on a GMC truck applied a prime coat of cutback asphalt MC-1 at the approximate rate of 0.25 gallon per square yard at least 24 hours in advance of the placing of the first hot-mix course.

Two Barber-Greene finishing machines, working one in each lane, laid the hot-mix courses. Four rollers provided the compaction; two rollers were Huber 10 to 12-ton tandems, and the other two were 10 to 12-ton three-wheel Hubers.

The base course of asphaltic concrete was an open-graded mix containing coarse aggregate graded from 1½-inch down to No. 4, plus fine aggregate, mineral filler, and asphalt cement. This course was laid at the rate of 250 pounds per square yard, giving a compacted thickness of approximately 2½ inches. Before the binder course was applied, the base course was given a fog coat of cutback asphalt RC-1, applied at a rate of less than 0.1 gallon per square yard.

Binder and finish courses were applied at the rate of 150 and 100 pounds per square yard respectively, producing compacted thicknesses of 1½ and 1 inch. Total thickness for the three courses was approximately 5 inches. Coarse aggregate for the binder material was graded from 1 inch down, and the finish course had a maximum size of ½ inch.

Each course was test-rolled with the Ferguson roller ballasted to a maximum of 50 tons in the heat of the day following the laying. The big roller was pulled by a Hough Payloader equipped with a boom attached to its hoisting arms for use in loading and unloading the ballast from the roller.

New Hot-Mix Plant

Rieth-Riley set up a new Hetherington & Berner asphalt plant for this project. The plant, with a 5,000-pound pugmill capacity, was operated entirely by electrical and hydraulic controls. A special feature was the glass enclosure of the scale dials, giving added protection against inaccuracies due to dust. A 12-cylinder Caterpillar diesel with 375-kva generator supplied electricity. Steam was furnished by a Cleaver-Brooks boiler burning No. 3 fuel oil.

Mineral filler was received in bulk

truck deliveries and stored in a Butler tank which had receiving facilities and elevator similar to standard cement-handling facilities. Aggregates were received by truck from commercial sources and were fed to the cold elevator by a Northwest crane with 1½-yard Owen clamshell bucket. The 60 to 70 penetration asphalt cement was delivered in 4,000-gallon truck transports direct from the refinery at Robinson, Ill., and was stored in two steam-heated tanks having a capacity of 10,000 gallons each.

Personnel

F. C. Stockmaster was superintendent of grade and base operations for Rieth-Riley Construction Co., while J. O. Pfauth supervised the bituminous construction. Project engineer for the Indiana State Highway Commission was Jerome Dustin who was assisted by A. M. Rucker, Maurice Harrell, and W. E. Pettit, as well as a number of inspectors. The testing section maintained a field laboratory on the site for accurate control of mixes and verification of densities.

The project was carried out within the Seymour district, of which R. H. Harrell is district engineer and W. L. King assistant district engineer of construction. C. E. Vogelgesang is chief engineer of the Indiana department. The Asphalt Institute was represented on the job by John H. Goshorn. THE END

Line of Bulldozers For Crawler Tractors

■ Literature on its inside-mounted bulldozers for International TD-18W, TD-14W, and TD-9W tractors is available from the American Tractor Equipment Corp., 9131 San Leandro Blvd., Oakland 3, Calif. The Ateco dozer mounts directly to the transmission case. A cross tie transmits thrust to the drawbar hinge point, the strongest point on the tractor. A cylinder support bracket acts as a load-carrying bridge to the rear transmission case.

Cylinders are located inboard, out of the way, yet directly in line with the push arms. All operating and mounting parts are kept well back of the tractor's center of gravity to eliminate nose diving and to reduce stresses and wear on track rails, wheels, and idlers. Blade widths are offered in 7-foot 11¾-inch and 7-foot 1½-inch sizes.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 309.

HRB Literature Available

"Flexible-Pavement Design", Bulletin 80, is available from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. The booklet presents factual information on the main features of design methods currently in use by various state highway departments for the thickness of flexible pavements.

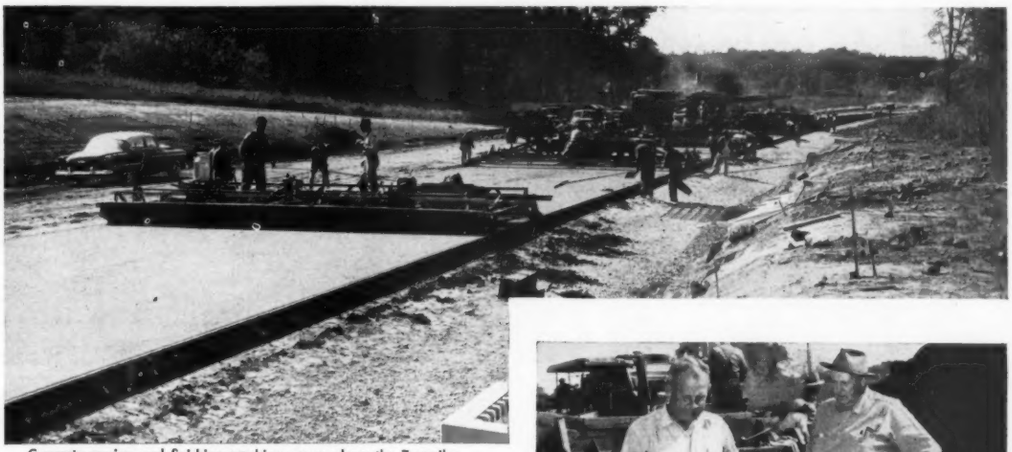
The nation-wide survey was begun in 1949. It was undertaken in view of the great variety of approaches being utilized and for the purpose of indicating the desirability of a certain measure of standardization. The pamphlet, selling at 30 cents a copy, may be obtained from the HRB.

Welding Electrode Data Lists Buildup Uses

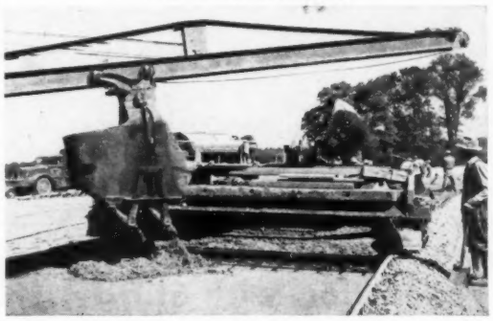
■ A bulletin on a high-speed buildup welding electrode, said to offer a faster deposition rate to help preserve the desirable properties of manganese steel, is available from the Rankin Mfg. Co., 3072 W. Pico Blvd., Los Angeles 6, Calif. The Ranite rod, an improvement on the company's Type A electrode, provides the toughness required of a built-up base for such applications as crusher rolls and mantles.

Since the deposition rate is increased, less heat is induced to the parent metal, minimizing stress and pull. The rapid deposition, said to be 20 per cent faster when run on straight polarity, also means less welding time. Application procedures, specifications, and prices are listed in the descriptive bulletin.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 217.



Concrete paving and finishing machines move along the Turnpike Extension, near Fort Washington, Pa. Contractor, C. J. Langenfelder and Son, Inc., Baltimore.



First-course pouring at King of Prussia. Contractor, George M. Brewster Co., Bogota, N. J.

Two Turnpike field engineers, Ralph Danner, senior mixer inspector, and F. J. Shoemaker, resident engineer, inspect a Bethlehem Dowel Unit immediately prior to pouring at Fort Washington.

360 Miles Without a Stop Light

With the completion of the 33-mile-long Delaware River Extension of the Pennsylvania Turnpike, this "granddaddy" of superhighways will stretch 360 miles across the Commonwealth, enabling motorists to travel from the Delaware River, by-passing the city of Philadelphia, to Pittsburgh and the Ohio border without a single traffic light or cross-road intersection.

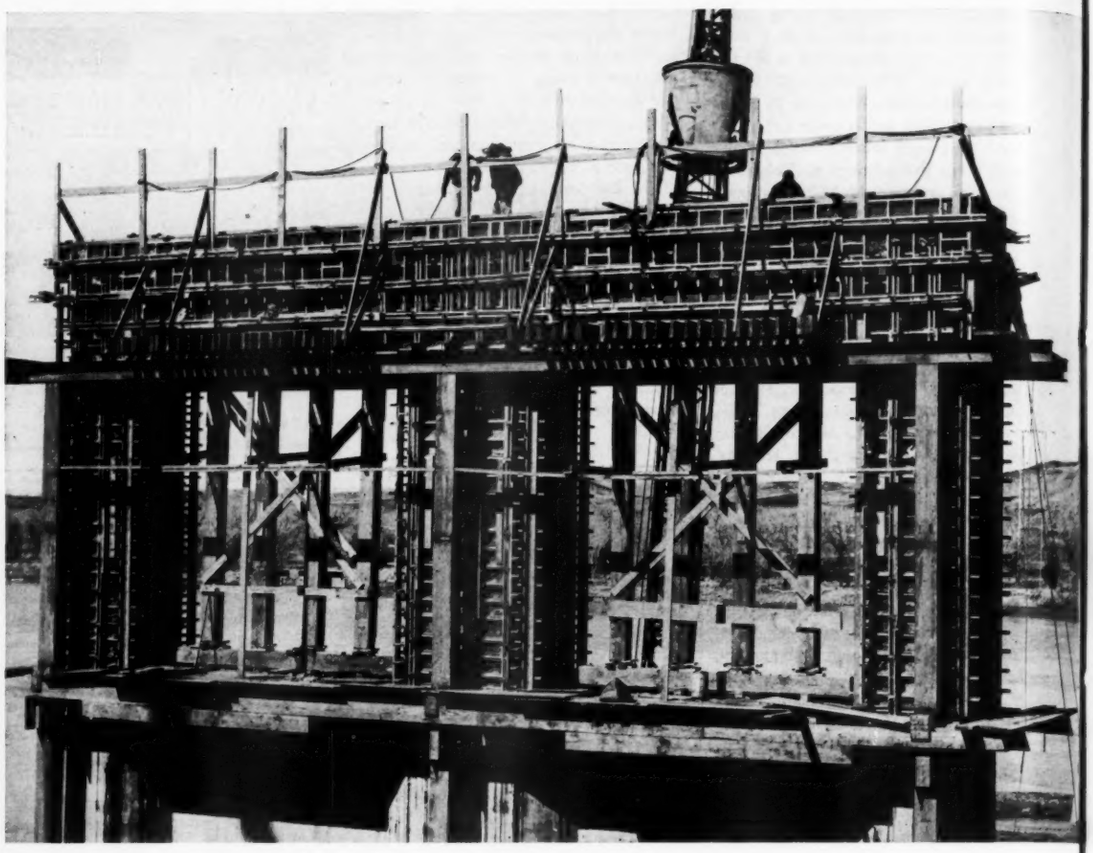
The work now in progress will extend the highway east to a point on the Delaware River where a new bridge and highway link will connect with the New Jersey Turnpike, thus forming a limited-access expressway from Metropolitan New York to Pittsburgh and beyond.

The pictures show paving work on the new extension at Fort Washington and King of Prussia, near the present eastern terminus of the highway. Bethlehem, which is well-represented all along the Turnpike, is furnishing dowel units, reinforcing steel, bar mats and other highway steels for the Delaware River Extension.

Inspecting the paving at King of Prussia are F. W. Engelman, resident engineer; Bing Matcher, Turnpike inspector, and Felix Mandato, concrete foreman.

Insulated Forms Cut

Forms for this pour are lined with blanket-type insulation, doing away with the necessity for housing or external heat. Concrete within the forms stayed above 60 degrees for 10 days in temperatures which reached 16 degrees below zero.

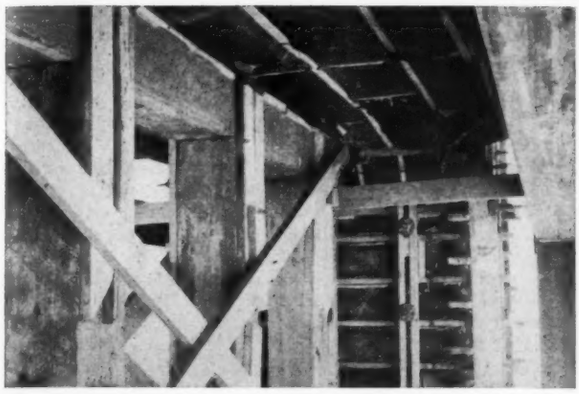


PLACING CONCRETE in cold weather does not necessarily require cumbersome and costly enclosures and heating equipment. This fact was effectively demonstrated during winter construction work on piers for a new highway bridge across the Missouri River at Chamberlain, S. Dak.

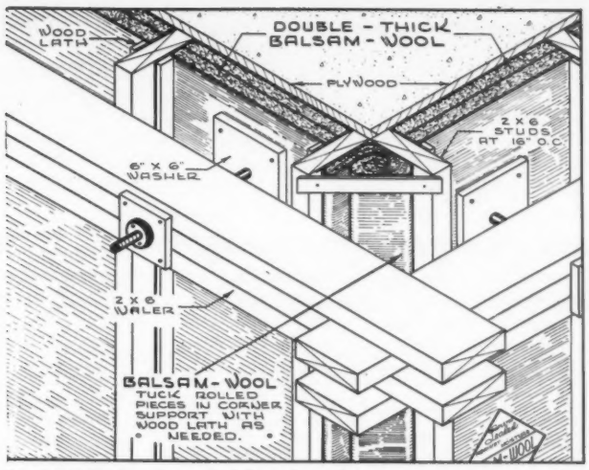
By lining the forms with double-thick Balsom-Wool insulation, the contractor was able to maintain a temperature well over the minimum required by the specifications without the use of any enclosure or any external heat. This was possible because the insulation helped retain not only the heat which was in the mix at the time of placing but also the "heat of hydration" generated within the concrete by the chemical action accompanying the setting of the cement.

After casting some of the piers by the conventional winter housing and heating method, the contractor requested permission to substitute insulated forms. Permission was granted with the provision that auxiliary heat be available in case of necessity. Accurate records of

Cut Winter Concrete Cost



This closeup view of the underside of a form shows the insulation placed between the form studs under the pier cap as well as on the vertical forms.



This detail drawing of a typical form shows the type of construction and the method of applying the insulation in the Chamberlain highway bridge project.

temperatures on the first two piers poured in the insulated forms indicated that the temperatures in the concrete were well above the specified minimum, even though the air temperature had dropped as low as 16 degrees below zero. From here on, it was not considered necessary to keep records, and the insulation method was used on five more piers with the complete approval of the project engineer in charge of the work.

Use Old Trusses

Piers for the new highway bridge were constructed by James & Cunningham, a joint venture of the Guy H. James Construction Co., Oklahoma City, Okla., and the Condon-Cunningham Co., Omaha, Nebr. At the same time, the Guy H. James Co. was building the substructure for the new Chicago, Milwaukee, St. Paul, & Pacific railroad bridge which parallels the highway bridge.

The new bridges were necessary because the old spans were below maximum flood level of the huge reservoir being created behind the Fort Randall Dam 90 miles downstream.

The deck of the new highway bridge is a composite of two old truss bridges and some new spans. Since roadways of both old bridges were narrow, the old trusses were mounted side by side in pairs on common piers to make separate lanes for east and west-bound traffic across the river. One set at 256-foot trusses came from an abandoned bridge at Wheeler, 75 miles downstream from Chamberlain. Four trusses with 336-foot spans were moved downstream about 600 feet from the old Chamberlain highway bridge.

Floated to Site

The job of moving the trusses from the old bridges to the new piers was sublet to John F. Beasley Construction Co., Muskogee, Okla. Beasley used two pairs of high towers mounted on barges. The towers straddled the ends of a truss, while big power winches, with their cables reeved through gigantic sheaves, raised the complete span off its piers and lowered it to the barges. The complete rig was then floated to the new bridge site where the truss was placed on the new piers. This process was repeated for each span.

Winter Construction

Construction of the new piers was carried on through the winter so the contractor could finish working in the main channel area before spring floods. It was in the course of this winter construction that the decision was made to try insulating the forms instead of housing and heating the piers.

Lifts of about 20 feet were formed and poured as a unit. Forms were of plywood with 2 x 6 studs spaced at 16 inches, backed by 2 x 6 double wales, and tied through with tie rods. The double-thick Balsom-Wool insulating blanket was placed between the studs against the plywood form. Tabs of the asphalt-

(*Continued on next page*)

(Continued from preceding page)

saturated liner of the blanket were secured to the studs with wood strips. Wherever a tie rod pierced the insulation, a 6 x 6-inch plywood washer was placed over the rod and held snug against the insulation by nailing it through the insulation into the form.

Concrete was produced at 60 degrees using cold aggregates, cold cement, and hot water. After the placing of a lift, a tarpaulin covering was installed over the top of the pour and heat was supplied to the top surface by a propane-burning blower-type heater. This top surface was kept warm until the next lift was poured. No covering was used over the insulated forms, and no additional heat was supplied.

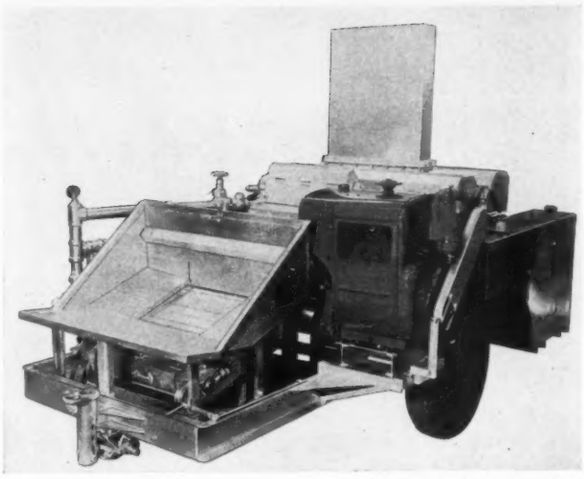
Specifications required that the concrete be maintained at a minimum temperature of 60 degrees for the first five days and 50 degrees for the next five days, and then permitted to gradually drop to outside temperature over a period of 48 hours. Temperature readings taken on the first two piers poured with the insulated forms indicated that the temperature rose from the 60-degree pouring temperature to a maximum of 90 to 100 degrees about the fourth day. At the end of five days it was dropping, but still above 80. After ten days, the concrete was still above 60 degrees, although the specifications only required a temperature of 50 at this point. When the forms were left in place as long as 15 days, the concrete temperature still remained above 40 degrees, although the outside temperature during the test dropped as low as 16 degrees below zero and daily minimums were all below freezing.

Form panels were removed and re-used on other piers a minimum of three times without the need for replacing the insulation. According to the contractor, the cost of furnishing and placing the insulating blankets was less than $3 per cubic yard of concrete. As compared with an estimated cost of $6 to $10 per cubic yard for housing and heating by conventional methods, this method represented a saving of $3 to $7 per cubic yard of concrete. Re-use of the forms without replacing the insulation increased this saving materially.

In addition to the saving in cost, the insulated form practically eliminates the fire hazard which is present when heated housings are used. This was demonstrated on the railroad bridge project at this same location. On this project, there were four fires during the winter caused by heaters igniting the plywood and canvas housings. These fires were not only costly, but they also endangered the lives of the workmen. In contrast, there were no fires on the seven piers which were poured in the insulated forms.

More experiments such as this one may lead to enough knowledge and data about this method of protecting concrete against the cold of northern winters and high-altitude nights so that contractors will be able to continue concrete-placing operations on an economical basis throughout the winter. Data from this project has been summarized in Technical Bulletin No. 83, which is available through Wood Conversion Co., First National Bank Building, St. Paul, Minn., manufacturer of Balsom-Wool insulation.

Project Manager R. E. Leech of James & Cunningham not only supervised the entire project but was also the moving force behind the insulated form tests. He was assisted on the highway bridge job by W. D. Greer, superintendent for the contractor. Although the cost of the structure was borne by the federal government as a part of the over-all Fort Randall Dam project, plans and supervision of construction were provided by the South Dakota State Highway Commission. Plans were prepared under the supervision of K. R. Scurr, state bridge engineer. Project engineer on the construction was U. R. Molseed. H. C. Rempfer is state highway engineer. THE END



The new McConnaughay HTD-JR asphalt mixer.

Portable Asphalt Mixer

■ A new portable asphalt mixer featuring versatile handling of both hot and cold mixing is announced by K. E. McConnaughay, 217 N. 6th St., Lafayette, Ind. The new HTD-JR unit will handle 120 tons of cold mix or 20 tons of hot mix per hour as a continuous mixer. It is especially recommended as a continuous mixer for production of cold mixtures.

The unit has a metal conveyor that is 24 inches wide for proportioning the aggregate. A 55-gallon-per-minute positive displacement pump provides for proportioning the bituminous material.

For further information write to the company, or use the Request Card at page 18. Circle No. 280.

Bulletin on Trencher

■ A new bulletin on its Model 140 trencher has been issued by the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. This unit has been used for over 15 years for work on pipelines, water lines, drainage, irrigation, sewer lines, and utilities. It is suitable for work from 18 to 30 inches wide and up to 5½ feet deep.

Special features of the machine's design and construction are described in the bulletin. Recent action photos illustrate the various job applications within the scope of the unit. The bulletin contains complete dimensions and specifications, including a table of digging-wheel and crawler-speed combinations available in the company's multi-speed transmission and a table of standard and maximum cutting widths. Optional extra equipment is also described briefly.

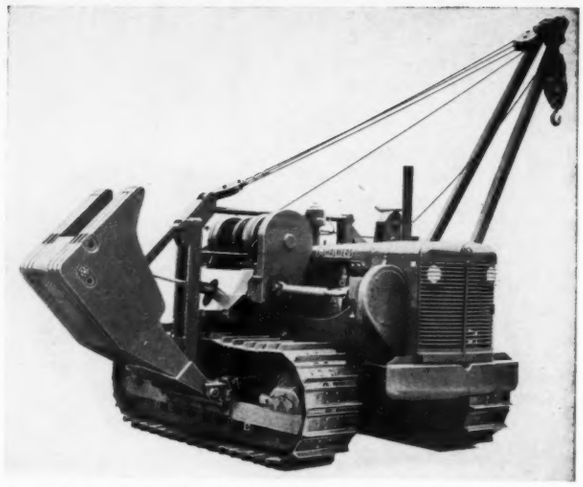
To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 246.

Line of Wheelbarrows

■ A line of wheelbarrows is illustrated in literature from the Champion Wheelbarrow Co., P. O. Box 138, Byron Center, Mich. Features described include special axle hangers for quick assembly, wide-spread legs, and concealed skid shoes.

The line includes seven models in capacities ranging from 3 to 5 cubic feet heaped. The units are offered with pneumatic, semipneumatic, and steel wheels, and with clear oak or tubing handles.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 226.



The new Tractomotive Model TSB-9 side boom mounted on an Allis-Chalmers Model HD-9F crawler tractor.

Improved Side Boom for Crawler Tractor

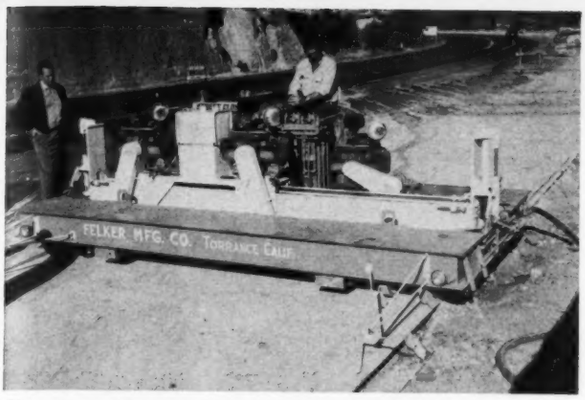
■ A new crawler-tractor side boom has a 38,000-pound lifting capacity at a 4-foot overhang. The Model TSB-9, announced by the Tractomotive Corp., Deerfield, Ill., is for the 72-drawbar-hp Allis-Chalmers HD-9F tractor. Two similar but larger side booms are already in the field, the Models TSB-15 and TSB-20.

Among design improvements is a front-mounted power takeoff which offers several advantages. Power is taken from a live shaft so that the side boom works independently of the tractor master clutch. In addition, the use of a front power takeoff leaves the back of the tractor free for installation of a winch or other rear-mounted equipment often required in a machine of this size.

The second new feature of the side boom is the twin clutch arrangement on the power takeoff. This consists of two multiple-plate twin disk clutches, one for raising and one for lowering. By pulling one lever, the operator can change from "raise" through "neutral" to "power down" on either the load or boom line. No gear shifting is necessary.

The side boom has a counterweight of 6,500 pounds which is extended and retracted hydraulically. Drop-proof counterweight linkage is standard equipment. The toggle-type linkage is so arranged that the counterweight is supported entirely by the fully extended linkage. This means that the hydraulic system is not required to hold the counterweights in this position. The boom is a sturdy box-beam section, 15 feet long, which pivots on replaceable, hardened pins and bushings. It is spread wide at the top for ample sheave-block clearance. An automatic clutch throw-out prevents the boom from bending against the stops. The sectional frame members are pin-connected for fast installation and easy removal for either shipping or tractor servicing. The total width with outer frame members removed is 8 feet 2 inches.

For further information write to the company, or use the Request Card at page 18. Circle No. 291.



This contraction joint-sawing machine was built and tested by the Felker Mfg. Co.

Highway Machine Saws Contraction Joints

■ Initial tests of its new contraction joint cutter for concrete paving have proved successful, according to the Felker Mfg. Co., 1125 Border Ave., Torrance, Calif. The new Di-Met machine is 14½ feet wide and 8 feet deep. It is equipped with ball-bearing wheels and rubber tires and is so designed that it can ride on either the header boards of the new slab or one side on the headers and the other on an existing parallel slab. The manufacturer reports that, under certain conditions, it can also roll directly on the green slab.

An H-beam serves as a track across the slab and supports a traversing carriage upon which are mounted two or more heavy-duty spindles. Operation of the carriage is reversible, sawing being performed in either direction. The spindles operate simultaneously, each carrying a blade which lowers into the concrete and takes a 6-foot traverse. The two cuts join up in the center of the slab, producing a 12-foot-long contraction joint.

Variable depths of cut up to 6 inches can be obtained. The machine is also capable of using several different Di-Met blade diameters. Each blade is driven by an independent 26-hp gasoline engine with its own battery and starter. A third engine of equal horsepower drives a three-stage hydraulic pump. Individual hydraulic motors on the rubber-tired wheels provide power for road travel.

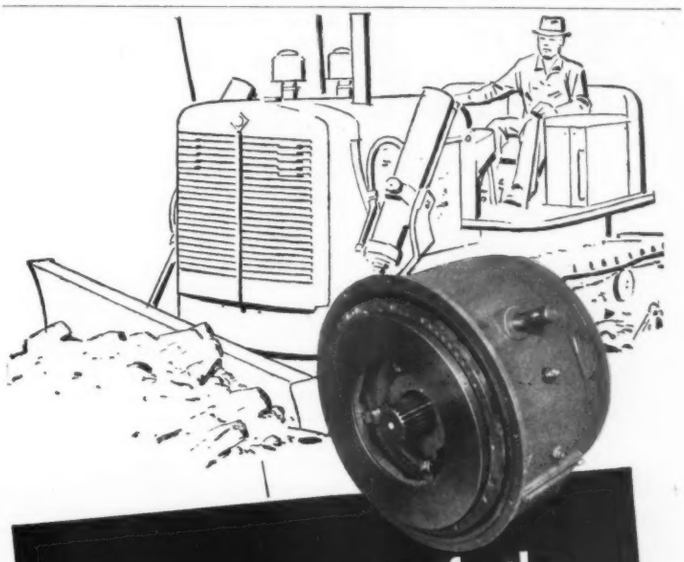
By means of selector valves, hydraulic fluid is diverted as required for forward and reverse locomotion, steering, hydraulic lifting and lowering of the track and blades, and transverse travel of the diamond-blade carriage. The diamond blades are lowered to a pre-set position, then eased into the concrete at a slow gradual feed rate. When retracted blades clear the concrete, a safety lock engages, preventing accidental descent and possible blade damage.

The machine turns in a circle whose diameter is no bigger than its own length. This is made possible by a center caster wheel which is hydraulically lowered.

The diamond wheel traversing speed is variable from zero to about 25 feet per minute. Road speeds for moving from one cut to the location of the next are adjustable up to 75 feet per minute.

For further information write to the company, or use the Request Card at page 18. Circle No. 310.

Army Finance Center Building, Fort Benjamin Harrison, Indianapolis, Indiana. Contractors: Sherry-Richards Co., Corbetta Const. Co., Inc., Willcox Const. Co., Inc., James McHugh Const. Co.



Announce New Four-Wheel Tractor And Crawler Model With Increased HP

■ A new 150-hp four-wheel tractor and a 150-hp version of its diesel D8 crawler tractor have been announced by the Caterpillar Tractor Co., Peoria 8, Ill. The new wheel tractor, Model DW15, has a wheelbase of 121½ inches and runs on 12:00 x 20 14-ply traction-type front tires and 21:00 x 25 20-ply rock-type rear tires. Over-all length of the unit is 16 feet 8 inches. The new tractor is designed for use with the Cat No. 15 scraper, No. 10 scraper, and W10 wagon, and includes wagon controls and windrow breaker.

The power source is a Caterpillar 6-cylinder D326 diesel engine, producing 150 hp at 1,800 rpm with 5⅛ x 6-inch bore and stroke. The engine features aluminum alloy pistons with a cast-in iron band backing for the top compression ring.

The standard transmission on the wheel tractor gives double speed ranges, with 10 forward speeds up to 24 mph and two reverse speeds up to 3.3 mph. Optional final-drive gears make possible speeds up to 31.3 mph.

Large-capacity wheel brakes are controlled by a foot pedal and have compressed-air boosters. An important feature is that brakes on the pulled unit are actuated automatically just before the prime mover brakes take hold, thus providing protection against jackknifing.

The flywheel clutch has an air booster which reduces clutch-pedal pressure when engaging and disengaging the dual 16-inch metallic clutch plates. A comfortable foam rubber seat has an adjustable snubber arrangement which minimizes rebounds and gives greater comfort.

The new 150-hp version of the Caterpillar diesel D8 track-type tractor was also recently announced and is powered by a Caterpillar engine with an output of 185 hp, and operating at a governed speed of 1,200 rpm. Listed among features of the new engine are a cylinder head incorporating improved valve springs similar to those used in the company's big V12 engines. Valve rotators lengthen service of the engine valves, and valve seat inserts of specially hardened metal are used for inlet and exhaust valves to increase durability and simplify servicing. A further feature is the oil-pressure control system, in which even cold stiff oil is quickly forced through the lines to the bearings, providing lubrication in most severe weather.

The newly introduced Caterpillar Model DW15 tractor.

The more powerful D8 will develop a drawbar pull of 29,200 pounds with the standard transmission in first gear and a drawbar pull of 39,800 pounds with the optional heavy-duty transmission. Calculated values for the maximum drawbar pounds pull when engines are slowed down by overload are reported to be 32,900 pounds with standard transmission in first gear and 44,840 pounds with the optional heavy-duty transmission.

Speeds of the latest D8 are increased over earlier models. Forward travel speeds with standard transmission range from 1.9 mph or 167 fpm in first gear to 5.8 mph or 510 fpm in fifth. With optional heavy-duty transmission, speeds are announced as 1.4 mph in first gear to 5 mph in fifth. Reverse speeds range up to 5.8 mph with standard transmission and up to 5.2 mph with the heavy-duty transmission. Another optional transmission is available which will permit a top speed of 7.2 mph. The over-all length of the new D8 is 16 feet ⅛ inch, and the height is 7 feet 2 inches. Width is 8 feet 7¾ inches.

For further information write to the company, or use the Request Card at page 18. Circle No. 187.

Left to right: Dr. Jacob Feld, consulting engineer and chairman of the program committee of the Concrete Industry Board, New York, N. Y.; Roger Corbetta, president of Corbetta Construction Co., Inc., New York City, and chairman of the board of the CIB; and Professor Gustave Magnel of Ghent, Belgium.

Prestressed Concrete Has Good Future Here: Magnel

Professor Gustave Magnel of Ghent, Belgium, international authority in the field of prestressed concrete, has predicted an increase for this type of construction in this country. The European engineer was guest speaker at a recent luncheon meeting of the Concrete Industry Board, held in the club rooms of the Building Trades Employers' Association in New York City. Professor Magnel is one of the founders of the bureau SECO of Belgium, an organization similar to the CIB here.

According to Professor Magnel, the restrictions of building codes in the United States have retarded the development of prestressed concrete. In Europe, where organizations like SECO control design and construction work, there is greater freedom for experimentation with new methods and materials, the speaker pointed out.

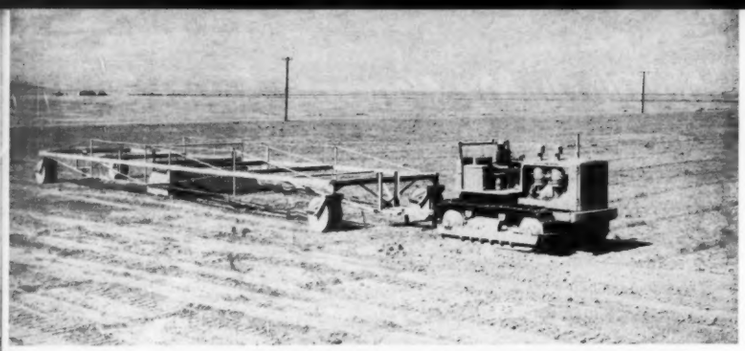
"Our engineers are no better or worse than yours," the professor stated, "and accidents are no more frequent in our country than yours. In fact I think we have fewer. We have had no accidents in prestressed concrete."

Professor Magnel remarked that Americans are poor concrete makers —that they save on labor costs in handling but make soup of their concrete. He suggested we should aim for stronger concrete, of no-slump consistency. This can be achieved with the use of better qualitative materials, improved concrete mixers, steel molds or forms, and external vibrators with sufficient frequencies, according to the speaker.

The professor also declared that there are too many systems in the world for post-tensioning in prestressed-concrete construction to be covered by specifications. He suggested that if the design of prestressed concrete were handled only by those engineers who are fully qualified, there would be less need for rigid specifications.

Flexible Steel Appoints

The new representative in Michigan, Indiana, and western Kentucky for Flexible Steel Lacing Co., Chicago, Ill., is John Bakke. He succeeds George W. Gramer. Flexible Steel manufactures belt fasteners for joining conveyor and transmission belts.



An Allis-Chalmers HD-15 diesel-powered crawler tractor pulls a land planer to level virgin land in California.

Rural Work Offers Jobs for Contractors

MODERN FARM conservation practices often call for large-scale earth-moving operations and offer the enterprising contractor, with his powerful and versatile machinery, a large variety of rural job opportunities. Land clearing and reclamation, irrigation and drainage, the construction of terraces and diversion channels, and pond and reservoir building are all commonplace jobs on the productive American farm of today.

The farmer must do, or have done for him, considerable terracing, ditching, grading, and leveling. In wholesale land-clearing operations that often surpass the average construction-site clearing job in scope, the farmer must remove trees, stumps, stone piles, and hedges. Thousands of ponds and reservoirs, part of the water control techniques that have helped increase the value of farms, are built annually. All but a small portion of these jobs require heavier equipment than the average farmer is likely to have on hand. Most of this work can be done efficiently with the crawler tractor, motor scraper, motor grader, and other equipment owned by the contractor.

The farmer feels justified in expending time, effort, and money for land improvement when he sees the increased production his land has yielded over the last two decades. In 1930, eleven million farmers produced somewhat under 8½ billion dollars worth of farm products (measured in 1939 dollars) on 987 million acres. Twenty years later, the 1950 Census of Agriculture found that farm employment had gone down to a little over 9½ million, but the value of farm output (in 1939 dollars) was over 12½ billion dollars. Meanwhile, the total farm land in use had increased by 172 million acres. This means that by 1950, thirteen per cent fewer farmers working 17 per cent more land were producing 50 per cent more farm products. Farm output for human use rose 47 per cent in this period. The result is that conservation jobs have become an established part of farming procedures.

The actual volume of potential business available to contractors from farmers planning conservation jobs is difficult to estimate, but it is undoubtedly large. How much more of this work contractors may obtain will be determined by the results achieved by contractors now matching their experience and equipment to this kind of work. To give the average contractor a better idea of the farm field, the Allis-Chalmers Mfg. Co. has recently published a market catalog that describes in some detail the various types of work available. In evaluating this market for contractors, the booklet discusses how typical construction machinery has been used efficiently for conservation work and tells something about the actual construction operations involved.

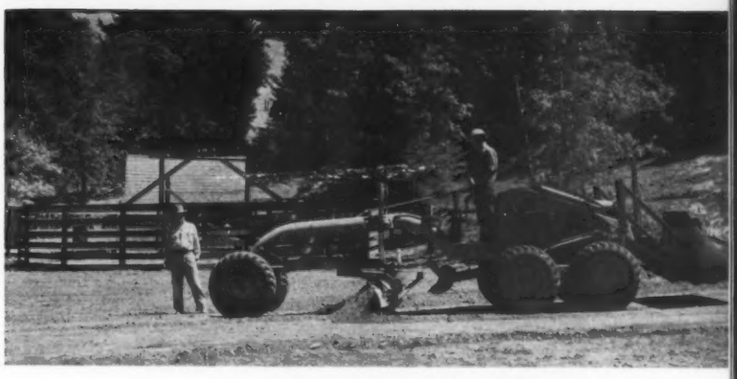
Land Clearing and Reclamation

Since about 1935, there has been a marked increase in the use of crawler tractors for land clearing and reclamation. The bulldozer is particularly adapted for this work and is used in many areas where stones need to be removed from fields before farm machinery can work the land. Original field stones, stone fences, or stone piles can be either removed or buried. This equipment is also used for stump removal, which is not restricted to cut-over forest localities. Orchards, old hedge fences, and even the farm woodlot offer possibilities to the contractor who keeps his eyes open for this business.

Across the country, brush removal from otherwise profitable acres is an important part of the land-clearing contractor's business. For every area, different methods are used—bulldozing, chopping, blading, and chaining. The state forester can provide valuable information on the availability of this work.

Tree removal is one of the toughest jobs in rural work. The experienced operator lifts as well as pushes with his bulldozer blade. In some instances, tree knockers are used to push against the trunk about 14 feet above the ground.

The contractor can also help the farmer by building dikes and levees to reclaim flood land. Levees and dikes are normally used to prevent water from flooding adjacent land. However, there is an increasing de-



This Allis-Chalmers Model D motor grader, working here with a rear-end loader made by the Tractomotive Co. of Deerfield, Ill., makes a versatile earth-mover for farm jobs.

Farm conservation jobs are a source of profit for contractors who can do the work efficiently with earth-moving machinery

mand for these structures combined with drop inlets to prevent gulleys from cutting back into fields.

The crawler tractor is also much in demand in many river-bottom areas for plowing down willows and other wet-land trees that keep crowding into farm land. Turning under mud, sand, and gravel deposits on fields that have been flooded is also a job requiring crawler tractor power.

Irrigation and Drainage

Putting in an irrigation or drainage system on a piece of land is another field for the contractor. The preliminary work on soil testing, surveying, and the hydraulics involved is usually handled by specialists of agricultural colleges and the soil conservation service. If these people have not been consulted, it is to the contractor's advantage to call upon them before beginning work.

When new land is going under irrigation, careful clearing of trees, brush, or boulders is required. For the grading and smoothing that follows, heavy earth-moving equipment has come into common use in recent years to speed up land leveling. Most fields need leveling with regular earth-moving scrapers, or with bulldozers if the hauls are short. After the soil settles, smoothing or planing is done with regular land levelers.

Ditching and border ridging can be a part of the contractor's irrigation job, too. Crawler tractors have the power needed to make large ditches or borders in one trip. In drainage work, stream bed straightening offers possibilities for the bulldozer, since trees or other water-slowing material must often be pushed into position to prevent bank erosion. In other cases, new channels must be cut or old ones filled. Using a mole to form an underground drainage channel is a farm practice in some areas, particularly the south.

There are two common types of drainage systems—the open ditch and the closed tile line. The motor grader is ideal for making broad shallow drainage ditches where the land is not too swampy. Crawler tractors handle all or part of many ditching jobs. Bulldozer equipment has a place wherever there are spoil banks to spread or tile lines to backfill.

Terraces and Diversion Channels

Both motor graders and bulldozers do a good job of building terraces and diversion channels. Crawler tractors also may be used to pull plows or terracing machines.

Of the two general types of terraces, one is chiefly for diverting water and may be called the channel terrace. The other type is designed to encourage the absorption of water. It is often called the ridge terrace and is built by moving earth from both sides toward the center. The channel terrace is often constructed from the upper side only.

The uppermost terrace is the one to build first, with each successive terrace down the slope being built in turn. The top terrace should be built well because the success of each terrace below depends on the first one.

(Continued on next page)

On land drainage jobs, a contractor may use a machine like this "mole" to form an underground channel. The scoop at the end of the long arm on this equipment is pulled underground at a depth of 30 or more inches. The colter at the front makes the initial cut.

(Continued from preceding page)

It is generally agreed that 1,200 to 1,600 feet is the maximum length that a terrace can carry water dependably. The distance between terraces is regulated by the slope of the land.

The first job in establishing drainage of diversion terraces is to provide suitable waterways to dispose of the runoff. If these are grassed waterways, they must be formed and seeded well in advance of terrace construction. Waterways can either follow natural drainage ways or they can be established at field ends. In either case, the channel must be formed and leveled quickly. Motor graders and crawler tractors with bulldozers are well suited to this work.

Wherever the land is rolling, it is quite likely the contractor will find some business in building diversion channels. Water-carrying diversion channels may be needed for a number of reasons: to carry surplus water into natural streams, to protect terraces, to fill ponds and reservoirs, and to divert run-off water into pastures where it can spread and be absorbed into the ground.

Pond and Reservoir Building

The farm pond is one of the most popular soil structures among farmers. Altogether, the United States has approximately 1¼ million dams which have required the removal of 1,329,000,000 cubic yards of earth. Crawler tractors with bulldozers and scoops build at least 95 per cent of ponds, while pull-type and motor scrapers are utilized on larger ponds and reservoirs.

As with building terraces and irrigation systems, the local agricultural authorities should be consulted in planning farm ponds. They understand the soil, local conditions, and construction requirements. Furthermore, they can be helpful in recommending the contractor for other jobs. For example, the local soil conservation districts are making surveys of soil and water construction needed on farms in their areas —valuable data for any contractor.

Reservoirs and dry dams are other water-holding structures, similar to the farm pond, that require crawler tractors and equipment which the contractor can supply. The dry dam is popular in some areas for holding run-off water, allowing it to flow out gradually for flood prevention.

Other Jobs for the Contractor

There is much farm building, and

nearly every house built has a basement, septic tank, or excavation for the furnace and fuel tank. The bulldozer, tractor-shovel, and the shovel with trench-hoe attachment are much in demand for this work.

Another job opportunity is linked with the average 6-mile distance a farmer must travel to a trading center. Over one-fifth of the nation's farms are 10 miles or more away from a trading center. It is obvious that a farm access road must be an all-weather road and that it needs to be maintained. Building these roads and doing some of the maintenance work on them is a job for crawler tractors and motor graders.

The crawler tractor also does an excellent job of building trails and fire lanes through forests and woodlots. Digging trench or pit silos is another task for the crawler tractor with its attachments. Since these silos are just a big hole in the ground, both bulldozer and shovel come in handy for these jobs.

In the west, and increasingly in the east, subsoiling is a favored farming practice. With pull-type subsoilers, this is largely a job for the crawler tractor's power. Blading, subsurface tillage, and trash farming are other phases of this work the contractor may find attractive.

The earth-moving jobs a contractor can find on or near a farm are numerous. Altogether, 29 different kinds of work are described in Allis-Chalmer's report, "Rural Jobs Offer New Opportunity for Contractors". This literature may be obtained by writing to the Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis., or by using the Request Card at page 18. Circle No. 275. THE END

Because the United States has a very rich economy we can use indefinitely 15 to 25 per cent of the total national production for defense—if we have to—without seriously affecting our standard of living, according to a recent report.

Truck Mixers Feature Improved Transmission

■ The 1954 line of Transcrete transit mixers features new rear-end controls, a newly designed drum brake, an improved chain drive, and an outswinging charging hopper. The mixers are available in 3½, 4½, and 5½-yard sizes.

Also of interest is the CMC mixers' right-angle drive. Power flows from a Ford or Chrysler automotive-type engine through a heavy-duty transmission into a modified truck rear axle. Here the direction is changed 90 degrees and the power is transmitted to the mixer drive pinion. The whole arrangement is designed to compensate for flexing from direction change or twisting. This is reported to eliminate all strain at the universal except that of torque.

For improved mixing ability, the drum is large in diameter and has deep L-section blades arranged in a progressively increasing spiral. A further feature of the new mixers is a low center of gravity with the weight distributed so that the trucks handle better.

A new bulletin describes the Transcrete line.

For further information write to the Construction Machinery Co., Waterloo, Iowa, or use the Request Card at page 18. Circle No. 284.

Agreement Permits Hobbs To Make Trailer Line

Under an agreement with E. A. Schonrock, president of the Schonrock Equipment Mfg. Co., San Angelo, Texas, the Hobbs Mfg. Co., Fort Worth, Texas, is now producing a complete line of Schonrock cable-dump-type trailers.

In addition to Hobbs' exclusive and universal rights to build the trailers, the agreement entitles Schonrock to continue to build special and experimental-type trailers in San Angelo. Mr. Schonrock will serve in an advisory and consultant capacity for Hobbs.

◀Among improvements in the Transcrete truck mixers for 1954 are new rear-end controls.

Construction equipment is displayed in the first floor showroom of Smith Tractor & Equipment Co., Irvington, N. J. *C&E Staff Photo*

Good Will Makes Good Business

"We Just Try to be regular guys," say the Smith brothers of Union, N. J. "There's no secret to this business; you've just got to know your customer and take an interest in his problems." This is probably the best reason why Elwin and Fred Smith, owners of Smith Tractor & Equipment Co., Inc., do more business now in one week than they did in a whole year back in the early thirties. The brothers still try to know every regular customer by his first name, and they literally bend over backwards to help him solve his problems.

One of the factors behind the smoothness with which the brother team operates is the way their personalities blend. Unlike the Smith brothers of cough-drop fame, Elwin and Fred are as different as brothers can be. "E" represents the typical executive—smooth, affable, always well-dressed, and looking right at home behind the big desk in his modern office. He is president and general manager in charge of sales, finances, and administration.

Brother Fred's office is the shop, and he can usually be found in it any time between 6 a. m. and 6 p. m. One of the hardest-working service managers in the business, Fred digs into the roughest repair jobs, often doing much of the work himself. He wears an old check shirt, the most beat-up pair of coveralls in the shop, and shaves about once a week. But as brother "E" boasts, "Fred is the best salesman we've got." Together they form a team that has built up one of the most highly regarded dealerships in the east.

Early Start

The brothers went to work early in life—both at about the age of 14. "E" started on a farm and later moved up to the job of construction equipment salesman. In 1926, Fred left the life of the sea and joined his brother in a contracting venture. They started out with one power shovel and within a period of four years had eight machines for rental.

But the depression soon changed the Smith brothers' plans. In the dark year of 1932, they left contracting and took over a small Caterpillar dealership in Irvington, N. J. Business was slow for several

years, but Elwin and Fred used the time to become good friends of their customers.

After the war, operations outgrew the Irvington quarters and were shifted in 1946 to the new building in Union.

Cover North Jersey

Today the company covers the 13 counties in northern New Jersey and handles all types of Caterpillar equipment, Bucyrus-Erie shovels, Case tractors, Butler bins, Adnun Black Top Pavers, Cleveland trenchers, Martin trailers, Baker snowplows, and Fleco rakes.

All of the company's facilities are stationed on the 4.6-acre site in Union, N. J. The main building fronts on U. S. 22, a 4-lane highway carrying traffic between New York and eastern Pennsylvania.

Constructed in 1946, the main building is pleasing to the eye as well as functional. In fact, for the last five years, the Garden Club of New Jersey has awarded a plaque to the Smith brothers for their civic achievements in improving the roadsides of a modern highway.

The two-story yellow brick building also provided the spark which ignited a vigorous industrial expansion program along the highway. Property values skyrocketed, and soon many light industries moved in and copied the attractive styling of the Smith building.

The offices, showroom, parts department, and service shop take up the main building's first floor, an area 27,000 feet square. The smaller second floor contains meeting and storage rooms.

On the east side of the main building, a large concrete storage apron parallels a 4-car siding of the Rahway Valley Railroad. New equipment is brought in by truck or rail and unloaded onto a concrete dock. The units are then stored out in the open or in the showroom until picked up by the owners.

Organization

The company has sales, office, parts,

(*Continued on next page*)

Fred and Elwin Smith, owners of Smith Tractor & Equipment Co., Inc., Irvington, N. J., discuss pending work in Elwin's office.

Mechanics in the service shop tighten bolts on a track with a Rodgers track press. The shop measures 120 x 80 feet and is equipped to do a complete rebuilding job.

C&E Staff Photo

and service staffs. The six salesmen and the sales manager occupy the two front rooms adjoining the private office of Elwin Smith, the president. General office work is done by nine girls, who use mostly IBM typewriters and Burroughs accounting machines.

The parts department, open from 7 a. m. to 5 p. m., requires a manager and nine men to handle the $600,000 worth of stock. Smaller parts are stored in neat metal bins in the main building, while large parts are kept in the 8,000-square-foot warehouse.

Parts records are kept on 28,000 cards filed under a Kardex system. When a part is removed from a bin, a clerk marks the appropriate card and checks to see how many parts remain in stock. If the supply is under the 60-day limit, she places a signal which results in a purchase order for new parts. Parts requisition slips from the service shop are sent to the stock clerks in vacuum tubes.

Service Shop

Both brothers are quick to agree that the real key to a dealer's success is service, and to keep things that way, Fred rarely accepts work from anyone but a regular customer. This policy prevents excessive overloading in the shop, standardizes many repair jobs, and assures an owner of good service. Often, Fred will even turn over, free-of-charge, the complete facilities of the shop to a contractor who wants to do his own repair job.

The 120 x 80-foot shop includes all equipment and machines necessary to do a complete rebuilding job. Work is carried on in three 40-foot bays serviced by one Wright 5-ton overhead hoist and four 3-ton hoists. For safety reasons, most of the hoists are hand powered. Two Hyster self-propelled cranes move parts and small equipment.

One of the company's most unusual jobs was assembling a huge tractor made of twin Caterpillar D8's. Its 20-foot-long and 6-foot-high dozer blade is now being used to stockpile coal for a local utility.

Service personnel consists of a manager and 32 mechanics, twelve of whom are kept on the road almost continually to service contractor's equipment in the field. Each man operates from a service truck. When he finishes a job, he calls the shop to get his next assignment.

Both brothers admit that the present business pace is making it difficult for them to keep in touch with all their customers. But even on their busiest days, they keep a sharp eye on the front door to make sure they don't miss saying "hello" to an old friend. THE END

Scotty Caswell, new heavy equipment sales representative for Midwestern Engine & Equipment Co. of Tulsa.

Midwestern Fills Post

Scotty Caswell, veteran Public Service Co. employee, has been appointed to the construction equipment sales force of Midwestern Engine & Equipment Co. of Tulsa, Okla. He will handle heavy-construction equipment sales in Oklahoma for the company in line with its recent major expansion.

Nine Dealers Named by Stoody

Distributing organizations for hard-facing alloys have been appointed by Stoody Co., Whittier, Calif. Among the nine distributors, two are in Phoenix, Ariz.—Consolidated Welding Supply Co., 747 Grand Ave.; and Phoenix Welding Supply Co., 112 S. 6th St. Two Texas organizations handling Stoody products are the West Texas Welder's Supply, 2614 West Wall, Midland; and Taylor-Simpkins, Inc., Monahans.

Other distributorships are Laird Welding & Mfg. Works, 13th and J Sts., Merced, Calif.; Welding Service Co., 637 Broughton St., E., Savannah, Ga.; Waterville Welding Supply, Waterville, Maine; General Distributing Co., 12 W. Galena St., Butte, Mont.; Quanrud, Brink & Reibold, Inc., Glendive, Mont.; McRary & Son, Inc., 198 Klingman Ave., Asheville, N. C.; and Welders Needs Inc., 1910 Vermont Ave., Toledo, Ohio.

Penn Assigns Joyce To Long Island Office

After six years in the parts department of the H. O. Penn Machinery Co.'s New York headquarters, Thomas A. Joyce has been assigned to Mineola, Long Island, where he is assisting the branch manager, E. W. Griffith, with inside sales work. Mr. Joyce will assume additional duties with the opening of a new Penn Co. building next month at Westbury, Long Island.

Panelli, All-American, Takes Anderson Sales Post

Former Notre Dame football star and All-American fullback, John R. Panelli, has been appointed sales representative for W. H. Anderson Co., Inc., Detroit, Mich., distributor of heavy-construction equipment. He will take full charge of the company's transit-mix demonstration and sales program. Anderson, maintaining a leasing organization with full complements of equipment,

Former All-American John R. Panelli is a new sales representative for W. H. Anderson Co., Detroit, Mich.

also staffs rental, parts, and service departments. The company's territory covers the eastern half of Michigan's lower peninsula.

Mr. Panelli, who will assume his duties after completing an intensive factory and field program, played football for the past three seasons with the Chicago Cardinals. He also played two seasons with the Detroit Lions before being traded to the Cardinals. A graduate of Notre Dame University, he was a member of the varsity squad from 1945 to 1948. He was named All-American in 1948, and was awarded the Players Trophy for outstanding play in the 1949 East-West Game.

Osgood-General Appoints West Coast Distributor

The full line of Osgood-General excavating and material-handling machinery will be carried in northern California and the southern counties of Oregon by the West Coast Engine & Equipment Co., 1077 Eastshore Highway, Berkeley, Calif., according to an announcement from the Osgood-General home office at Marion, Ohio. Frank Johnson, formerly division sales manager for Osgood-General sales in California, has joined the staff of West Coast to direct sales.

Three companies affiliated with the new distributor will handle Osgood-General parts. They are Rhea Tractor & Engine Co., Sacramento, Calif.; Hoover Tractor & Engine Co., Woodland, Calif.; and Equipment Sales & Service Co., Stockton, Calif.

Changes at Copco Pacific

The exclusive western distributor of Atlas rock drills and Coromant drill steels, Copco Pacific, Ltd., San Carlos, Calif., has appointed Howard L. Brown manager of its Phoenix, Ariz., district office and has transferred Carlos E. Milner, Jr., to Spokane, Wash., where he will head company operations.

St. Paul Hydraulic Hoist Adds Two Distributors

Two firms have been added to its list of distributors by St. Paul Hydraulic Hoist, Minneapolis, Minn. Corts Commercial Body Works, Whitesboro, N. Y., will be exclusive distributor of the company's products in and around Utica, N. Y., while Timpte Bros., Inc., Denver, Colo., has been granted sales rights for the entire state of Colorado and all but eight northern counties in Wyoming.

St. Paul Hydraulic Hoist, a branch of Gar Wood Industries, Inc., Wayne, Mich., manufactures a com-

Distributor Doings

plete line of hydraulic hoists and dump bodies, Pax-all refuse collecting bodies, Frate-Gate elevating end gates, and Truck Patrol underbody road maintainers.

Cleveland Vibrator Dealer

Handling the complete line of vibrator equipment manufactured by the Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland, Ohio, is the Industrial Vibrator & Machinery Co., 7 Front St., San Francisco 11, Calif., new west coast distributor.

Adjustomatic Dealers

Two new distributors of Adjustomatic scaffolding in the south have been named by Automatic Devices, Inc., St. Louis, Mo. M. D. Moody & Sons, Inc., 4652 Phillips Highway, Jacksonville, Fla., will handle the company's products in northern Florida, while Peterson Machinery Co., 309 Seventh Ave., South, Nashville 4, Tenn., will distribute Adjustomatic scaffolding in northeastern Tennessee. Max Moody directs the Florida firm. H. R. Peterson and C. E. Goodwin have charge of the Nashville company.

Cummins Promotes Foreman

J. W. Fisher has been promoted to service manager of the Cummins Sales & Service, Inc., branch at Wichita, Kans. Formerly shop foreman of the branch, Mr. Fisher has been connected with the organization at Wichita since 1943. Cummins Sales & Service, Inc., has headquarters in Fort Worth, Texas.

Shriver Is Wooldridge Dealer

The Wooldridge Mfg. Co., Sunnyvale, Calif., has appointed the Shriver Machinery Co., 1756 Grand Ave., Phoenix, Ariz., its exclusive distributor in that state, with the

exception of Yuma County.

Featured in the Wooldridge line is the complete new series of open-bowl Terra Cobra self-propelled and tractor-drawn scrapers, together with rippers, cable-control units, and bulldozers.

Distributor Groups Tour McKiernan-Terry Plants

More than 100 members of the 65 distributor organizations for the Pile Hammer Division of McKiernan-Terry Corp., New York, N. Y., viewed the step-by-step manufacture of the company's pile hammers while guests on an all-day tour of McKiernan-Terry plants in New Jersey.

A briefing on various plant operations and the company's facilities for designing, engineering, and manufacturing special machinery was given by John O. Smaltz, president of the organization, prior to the tour.

Some 15 engineers were on hand to guide the distributor groups through the plants. Earle R. Evans, vice president of the Construction Equipment Division, and his assistant, G. Robert Compton, Jr., were in charge of the program.

Bitumen Study Grant

A two-year fellowship for graduate study in the use of bituminous materials and aggregates in paving mixtures has been established at Cornell University, Ithica, N. Y., by the New York State Bituminous Concrete Producers Association. The Cornell School of Civil Engineering said in announcing the fellowship that the university offers well-equipped laboratory and library facilities for the study and research in the bituminous paving field.

A candidate for the fellowship will be selected by the end of this month and will start work during either the summer or fall semester. Information about the grant can be obtained from Prof. Taylor D. Lewis, Lincoln Hall, Cornell University.

Ball-Bearing Swivels Rotate Under Heavy Loads

■ A line of ball-bearing swivels is illustrated in literature from the General Machine & Welding Works, Inc., P. O. Box 938, Pomona, Calif. The booklet contains complete drawings and engineering data describing a variety of swivels. Styles available offer combinations of hook, clevis, eye, swedge, forged eye, and tapered clevis. The swivels are shown in a variety of applications including their use with a heavy concrete bucket and with an overhauling weight.

The literature points out that precision angular-contact bearings are used in the swivels because these bearings have a greater thrust capacity than any other type. The breaking strength of the Miller swivel is about 25 per cent greater than that of the recommended size wire rope and about five times greater than the rated working load of the swivel. Work load ratings range from 700 pounds to 250 tons.

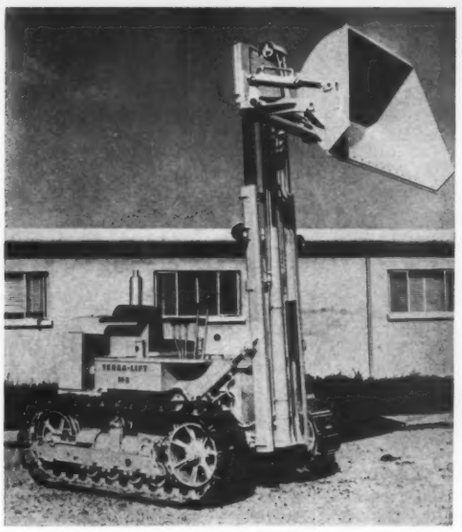
To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 232.

Versatile Fork Lift Features Attachments

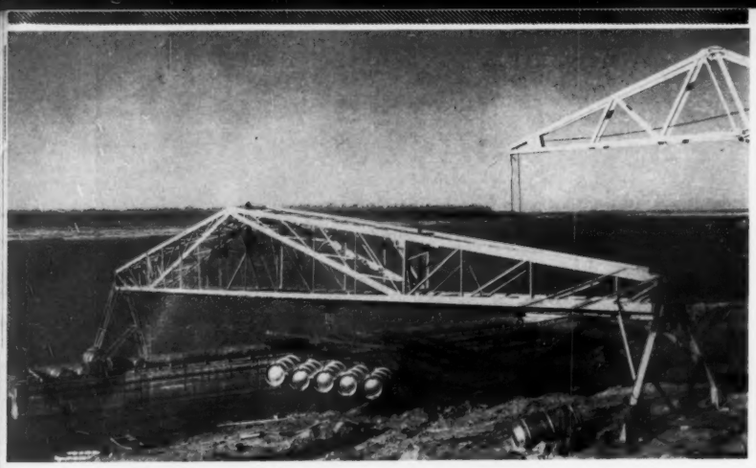
■ A multipurpose unit that can be converted from a 3,000-pound-capacity fork lift into a ¾-yard bucket loader, a 6-foot angling dozer, or a towing tractor of 30 drawbar hp is announced by the American Tractor Corp., 800 Fort Wayne St., Churubusco, Ind. The Terra-Lift will handle materials while operating in deep mud, sand, or snow, and is said to achieve good traction on ice.

Available with a 9 or 12-foot lifting mast, the machine is capable of handling material from an unpaved work area to a second-story height. Ground pressure under full load is 6 psi.

For further information write to the company, or use the Request Card at page 18. Circle No. 313.



The track-mounted Terra-Lift features easy convertibility.



New River Crane—A special crane with 225-foot-long traveling hoist developed by R. G. LeTourneau helps unload material from a Mississippi barge. One end of the rig rests on stable ground far back from the river bank while the other rests on a pontoon. The crane, which can reach out 150 feet, has a hoist capacity of 40,000 pounds.

Tower Goes Up—Atop Little Butte, 2,000 feet above the Snake River plain in Idaho, KID's 200-foot television tower is erected by a Lorain Moto-Crane with a 100-foot boom. The 140 x 100-foot site blasted on top of the butte lies inside a restricted area where the AEC developed its atomic submarine engine.

Louisiana Road Program Costs $37 Million for '53

The Louisiana Department of Highways completed 502 projects costing a total of $37,748,725 during 1953, and at the present time has 375 additional projects involving total costs of $40,617,400 under construction, according to an announcement by the department director. The department also expended $15,549,535 for normal maintenance on the state's system of highways last year.

Projects included the widening and reconditioning of many miles of road to 24-foot highways, blacktopping and concrete surfacing, bridge and overpass construction, and the launching of a statewide secondary road program.

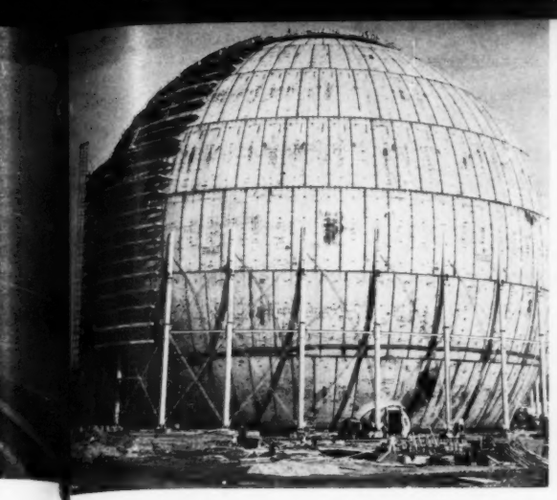
The year's most costly job entailed rehabilitating and widening to 24-foot widths of a total of 193 miles of 18-foot-wide highways, and surfacing the same highways with a concrete mixture. Total cost was $11,077,000. Next in point of cost was the completion of 424 miles of blacktopping in all sections of the state at a cost of $10,950,000. Several million dollars was spent on emergency highway work after extensive flood damage to roads early in the year.

The director said the facts that vehicular traffic has increased more than 200 per cent on the state's highways and that the construction dollar now is worth only 41 cents accounted for a major part of the huge expenditures.

Steel Terminology Is Full of Mystery

Crook, spy, arrests, charges, and hanging, familiar terms to mystery story fans, have entirely different meanings for the steel industry.

A "crook" in steel terminology, for example, is a distortion occasionally produced in cooling a casting. A "spy", sometimes referred to as a "trial bar", is a sample bar selected at random for inspection. Interruptions in certain steel processes and operations are called "arrests", while a "charge" is the name given to materials when they are put into a steel plant furnace. "Hanging" is what happens when raw materials stick to the sides of a blast furnace and form obstructions.



Atomic Sphere—A honeycomb of scaffolding curves around part of the 225-foot-diameter Knoll's Atomic Power Laboratory near West Milton, N. Y., allowing workmen to weld the structure's 682 steel plates. Center, workmen use Nelson semi-automatic stud-welding guns to install the insulation pins which will secure a layer of 2-inch Foamglas insulation to the sphere. Power for the arc-welding operation is provided by three Nelwelder battery units. Right, a closeup of the Standard interchangeable Safway scaffolds which form a framework hugging the huge ball. The scaffolds support platforms which give workmen access to the sphere's surface.

Civil Service Positions Open for Civil Engineers

Open competitive examinations for civil engineering positions at Wright-Patterson Air Force Base, near Dayton, Ohio, have been announced by the Board of U. S. Civil Service Examiners.

Applicants for the positions must have completed a full four-year professional engineering course leading to a bachelor's degree in an accredited college or university, or must have four years of technical engineering experience. In addition to either of these two requirements, those who apply for classification GS-9 must have 1½ years of professional engineering experience, while applicants for the GS-11 classification must show 2½ years of such experience.

Applications must be submitted on Standard Form 57, "Application for Federal Employment", which will be accepted until further notice, and Form 5001 ABC. Forms may be obtained from any post office. Form 57 must be sent to the Executive Secretary, Board of U. S. Civil Service Examiners, Department of the Air Force, Wright-Patterson Air Force Base, Ohio.

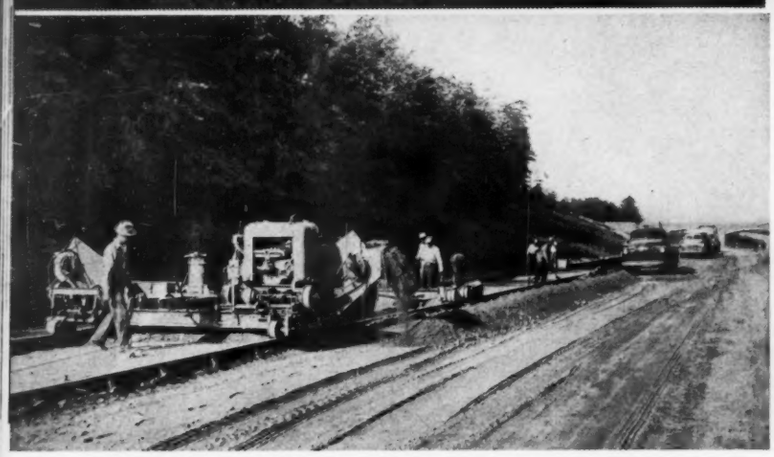
Powder-Actuated Tool Film

A full-color film strip titled "The Story of Powder-Actuated Fastening" has been made available by the Powder Actuated Tool Manufacturers' Institute, Inc., for use on a loan basis by trade associations, safety organizations, employee groups, technical schools, and other interested organizations. The film is designed to explain the basic applications and uses of tools employing the power of cartridges as a propellant to drive steel studs or pins into concrete or steel. The tool is used to fasten wood to concrete and steel, steel to steel, steel to concrete, and fabricated materials to steel and concrete.

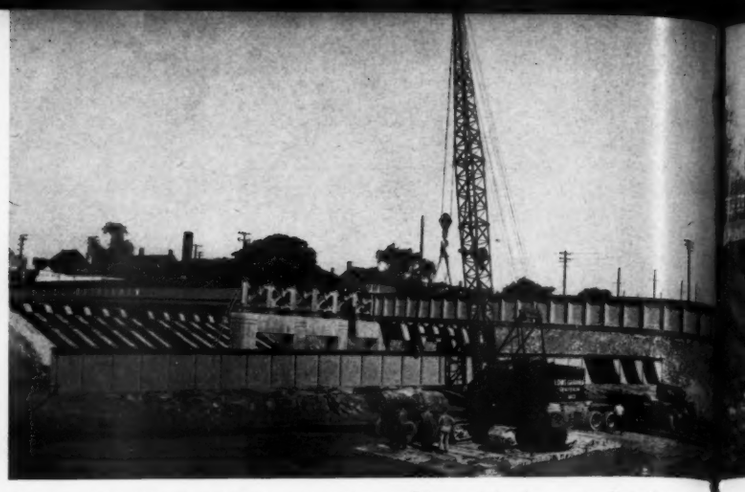
Also available is a booklet based on the film which tells the same story in photographs and text.

Information about the film (a ten-minute-long 35-mm strip) or the booklet may be obtained from Richard F. Webster, secretary, Powder Actuated Tool Manufacturers' Institute, 250 E. 43rd St., New York 17, N. Y.

Construction Camera



Fine-Grading—Working between concrete road forms placed 12 feet apart, a Buckeye machine fine-grades special subbase material on Maryland's Baltimore-Washington Parkway. Wright Construction Co., Columbus, Ga., has the contract for this part of the 36-mile-long divided highway.



Expressway Crossing—A Koehring crane picks up a 25-ton girder from a truck trailer and places it in position for an underpass being erected over the John C. Lodge Expressway near the heart of Detroit. This and the Edsel Ford Expressway through the city are expected to be in use by 1957.

Advise More Lanes On Conn. Expressway

Studies of expected traffic flow on Connecticut's projected Greenwich-Killingly expressway indicate a need for expanded construction plans, according to reports submitted to the state highway department by Ammann & Whitney and Coverdale & Colpitts, two New York City consultant engineering firms. The cost of constructing the roadway, estimated in the reports at just under $346,000,000, is expected to be self-liquidating, however.

The reports showed prospective earnings of $743,319,000 for the 129-mile-long expressway. Planning and financing fees will bring the total cost of the road to $398,000,000, requiring a bond issue for that amount.

Design recommendations of the consultants increase some of the four and six-lane sections proposed by the highway department to six and eight-lane width. The remainder of the route will be of two and four-lane design.

Planned to connect the New York state line at Greenwich with the Rhode Island state line at Killingly, the expressway will have entrance and exit ramps at more than 100 locations. There will be 198 bridges and viaducts to carry the road over railroads, streets, rivers, and highways.

All but the two-lane sections of the route are to have median strips separating traffic moving in opposite directions. The outside shoulders will be 10 feet wide and paved. The curves and grades will be gentle, the former not exceeding three degrees and the latter three per cent or less. Acceleration and deceleration lanes will occur at interchanges along the road.

The engineering recommendations

Fast Digging—Working on a gasoline pipeline job in New Jersey, this Cleveland Model 320 trencher digs a mile of 40-inch-wide and 4-foot-deep trench per day. Pipeline Construction & Drilling Co., Camp Hill, Pa., is laying the 16-inch line along the 84-mile stretch between Woodbury and Linden.

Halfway Mark—Foundations and columns for a 17,250 BPD fluid hydroformer are half completed at the Cities Service refinery in Lake Charles, La. Design, engineering, and construction are being handled by the M. W. Kellog Co., engineering contracting subsidiary of Pullman, Inc.

call for divided highway throughout the route except for the sections between Flanders Corners in East Lyme and State Highway 2 in Montville, and between State Highway 2 in Norwich and the Rhode Island line at Killingly.

Assuming full use of the 1954 construction season, it is estimated that 1958 will be the first full year of operation by the expressway. The estimate, according to the state highway department, is based on the assumption that New York State will have completed its New England thruway from New York City to the Connecticut border.

ARBA Paper Is Issued On Resurfacing Technique

A relatively new resurfacing technique, bituminous concrete reinforced with welded wire fabric, is discussed in a paper issued by the American Road Builders' Association. Written by Norman G. Smith, assistant engineer of materials and standards, District of Columbia Highway Department, the booklet details construction steps taken in resurfacing about 3,000 square yards of 16th Street, N. W., in Washington, D. C., last fall.

Some of the difficulties encountered in the development of a successful construction procedure are discussed in the paper, which is illustrated with job photographs.

Though it is too early to draw final conclusions, the paper points out that good results have been obtained thus far with the welded wire fabric reinforcing.

The pamphlet is available, without cost, to all ARBA members. Copies of Technical Bulletin No. 204 sell for 50 cents and can be ordered from the association's offices in the World Center Building, Washington 6, D. C.

Widen Levee—Tractor-scraper teams, working on a generating plant for the Clifty Creek plant of the Indiana-Kentucky Electric Corp., widen a levee along the Ohio River. In the foreground, Caterpillar D8 tractors pull LeTourneau Carryalls. See "New Generating Plant to Power AEC Works", C&E, March, 1953, page 40.

Steel Erection—Traveling derricks owned by Bethlehem Steel Co. move in from both ends of the Raritan River Bridge to set huge steel girders. The bridge, paralleling the Edison Memorial Bridge, is the largest structure on New Jersey's Garden State Parkway. See "Parkway Bridge Matches Parallel Span", C&E March, 1954, page 52.

Industry-Government Team Makes Equipment Study

Members of four manufacturing firms and two government engineers comprise a team inspecting three United States defense bases in a study of construction-equipment maintenance problems encountered by the army's East Ocean Division. The group is visiting bases now under construction at Goose Bay, Labrador; Stephenville, Newfoundland; and Lajes, Azores.

The group includes Bruce Smith, assistant service manager of the central sales division of Caterpillar Tractor Co., Peoria, Ill.; James P. Kay, Euclid Road Machinery Co., Cleveland, Ohio; Ralph M. Holder, Barber-Greene Co., Aurora, Ill.; James H. Rucker, LeTourneau-Westinghouse, Inc., Peoria; John J. DeRisio, chief of the equipment branch of the army engineers' East Ocean Division at Richmond, Va.; and Neil Harrington of the engineers' Atlantic district.

A calendar of coming conventions appears on page 15 of this issue.

Yours for the Asking

Further information or descriptive literature can be secured from any advertisers in this issue of CONTRACTORS AND ENGINEERS. Just write name of manufacturer and product of interest to you on the extra line provided on the post card facing page 18, fill in your own name and industry connection, mail to us and we'll do the rest.

CONTRACTORS AND ENGINEERS

470 Fourth Avenue New York 16, N.Y.

New LeTourneau Building—An aerial view of the 85-foot-high LeTourneau Semisphere at Longview, Texas, showing how aluminum sheets are joined to form concentric circles. Ventilation is provided through a 255-foot-square opening at the top which is sheltered by a cone-shaped aluminum hood. Inside the Semisphere, lighting is provided by a 75,000-watt installation on the center pole. Although it is not necessary for support, the pole, used in the erection of the building, was left in place when the Semisphere was completed. Material hung from the dome provides control of acoustics. The building contains 70,686 square feet of space and can hold 12,000 persons.

Dome-Like Building Needs No Supports

IN A REVERSAL of the usual procedure, the LeTourneau Semisphere at the plant and corporation headquarters of R. G. LeTourneau, Inc., Longview, Texas, was built from the top down, with all construction being done on the ground. The building, which has no interior structural supports, consists entirely of steel and of aluminum sheets which are curved, embossed, flanged, and drilled to conform to the builder's design.

Construction started with the erection of a steel center pole, 94 feet high, to which a sliding steel collar was attached. A ring of aluminum sheets was bolted to this collar, the collar raised up the pole a few feet by a LeTourneau electric winch, and a second ring added to the first. This procedure was continued until 15 successive rings of aluminum sheeting were in place. As each new ring was added, jackstands steadied the bottom edge of the partially constructed dome. When the last ring

(Concluded on next page)

(Continued from preceding page)

was bolted, the edge of the building was lowered and secured to a foundation of concrete.

The completed building, 85 feet high, has a diameter of 300 feet. It covers 70,686 square feet and contains 3,289,402 cubic feet of enclosed space. The total cost of the structure averaged less than $4 per square foot of space.

Ventilation is provided through a 255-square-foot opening around the center pole. This opening controls the volume of air entering the building, and is sheltered by a cone-shaped hood at the peak of the dome. Inside the building, concentric rings of acoustical material are suspended from the ceiling to provide sound control. Near the top of the center pole is a 75,000-watt lighting installation. The lower part of the structure forms a 60-degree angle with the ground, providing headroom almost to the curved wall.

Designed as a portable building for large-scale religious meetings, the Semisphere had a forerunner in the dome-type auditorium of fabricated steel panels which R. G. LeTourneau built in Toccoa, Ga., in 1940. The auditorium, like the new structure, was also built without interior structural supports.

Capable of seating 12,000 persons, a Semisphere can be adapted to a number of uses: entertainments, indoor sports, manufacturing, warehousing, displays, and religious gatherings. The center pole can be either removed or left standing after the building is finished. Since the interior is clear and unobstructed, finishing details can be varied to suit the function of the building. Within generous structural limitations, the size and number of entrances can also be varied. The building provides weathertight space at low cost and can be erected quickly with semiskilled labor. THE END

Self-Propelled Saw For Land Clearing

■ A new land-clearing tool for use on jobs requiring the removal of trees and heavy shrubbery, and where flush-cut stumps and roots may be left in the ground, has been announced by the Little Giant Tree Feller Corp., 5425-63 N. Central Expressway, Dallas 5, Texas.

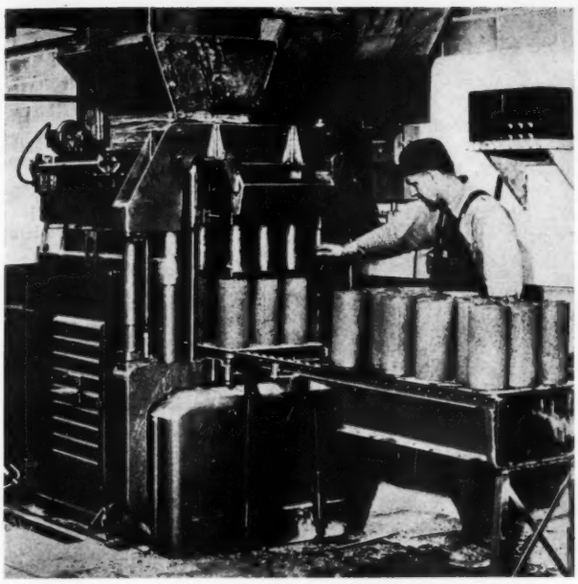
The Little Giant self-propelled saw can fell a tree, cut the stump flush with the ground, and turn its blade vertically to buck any length desired.

The Little Giant, an adjustable motorized saw, is a self-propelled unit with forward and reverse motion. It travels on two rubber-tired wheels at 3 mph, a comfortable walking pace. The machine is powered with a 2-cylinder 14-hp or a 4-cylinder 22-hp standard Wisconsin air-cooled gasoline engine. One man is required for its operation. Typical uses of the machine include clearing the right-of-way for pipelines, country roads, and electric power lines. The machine will cut everything from small brush to trees 5 feet thick.

The circular saw blades are furnished from 36 to 42 inches in diameter. They are adjustable, may be locked in any position, and will cut at any angle. A semiautomatic saw-blade gummer and sharpener, which will maintain the blades in the field, is also available. The driving head is mounted on a new type of universal joint with an action that permits raising or lowering the saw blade down to ground level so that trees may be cut, leaving either no stumps or high stumps, as required.

A chain-saw attachment is also available for this tractor saw. It mounts on the driving head, at the same point where the circular saw blade is attached, and can be changed in the matter of minutes. The chain-saw attachment is used for cutting trees of large diameter and is available in 36, 48, and 60-inch lengths. Longer lengths can be provided on special order.

For further information write to the company, or use the Request Card at page 18. Circle No. 190.



This new Columbia combination tile and block machine features quick mold change.

Concrete-Block Maker

■ A concrete-block machine said to produce drain tile, flue liners, water meter boxes, and other hollow shapes, as well as standard types of blocks, at a faster rate than previous methods is announced by the Columbia Machine Co., Vancouver, Wash. The manufacturer reports the machine has a new high-velocity agitator that insures the quick delivery of uniform batches into the molds.

The combination tile-and-block machine is basically the same as the company's Model 8 (two-block) and Model 12 (three-block) machines, using regular Columbia molds and standard racks and pallets. An innovation is the introduction of 12-inch-high molds, permitting the making of shapes which will fit into a mold opening of 18 x 12 x 16 inches on the Model 8, or 24 x 12 x 18 inches on the Model 12. The combination machine produces three to four pallets of concrete units per minute on the 12-inch-high molds and is faster on units 4 to 8 inches high. A feature of the combination machines, carried over from the standard block machines, is the quick mold change and short down time when going from one type of unit to another.

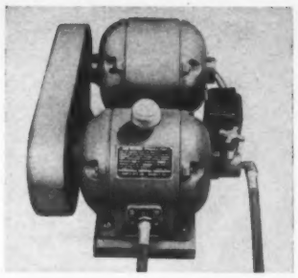
For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 314.

Wellman Appoints Brigleb

The appointment of Robert C. Brigleb as assistant sales manager, jobber replacement sales, has been announced by The S. K. Wellman Co., Bedford, Ohio, manufacturer of all-metal clutch plates, facings, and brake linings.

Mr. Brigleb has been associated with sales to automotive replacement jobbers, original equipment assembly manufacturers, or parts production for the past 15 years.

The new Manco Series H Hi-Thrust hydraulic pump package.



New Hydraulic Pump Is Electrically Driven

■ A new high-pressure electrically driven hydraulic pump is now available from the Manco Mfg. Co., Bradley, Ill. The Manco Series H Hi-Thrust pump is capable of delivering 2.04 gpm at 8,800 psi in intermittent operation. Higher output can also be obtained at lower pressures up to 4.5 gpm at 6,200 psi. The unit comes as a complete integral power package ready for operation.

The pump is a six-piston whobble-plate type with operation in either direction. It has operating speeds from 900 to 2,200 rpm, displacing 57 cubic inches per revolution. Units are available with 2, 3, or 5-hp, 220 to 440-volt, 3-phase, 60-cycle motors.

For further information write to the company, or use the Request Card at page 18. Circle No. 267.

Inspecting one of the Caterpillar product models at the H. O. Penn Machinery Co. operators school are, left to right: Stewart A. Wade, Penn executive vice president; R. E. Reed, Penn sales manager; Vincent E. Soefield, secretary to the president of the Operating Engineers union; and Daniel Hanlon of the Delhan Contracting Co. ►

Caterpillar School Draws 450 Workers

More than 450 operators, mechanics, and maintenance men completed a three-week Caterpillar operators course conducted at Hempstead, Long Island, N. Y., by officials of the Mineola branch of the H. O. Penn Machinery Co., Inc. The school, termed "highly successful" by Penn executives, offered instruction by representatives of the Caterpillar Tractor Co., Peoria, Ill., in operating techniques of dozers, pusher tractors, scrapers, rubber-tired units, motor graders, shovels, and engines.

Individual Caterpillar certificates were presented to those attending the school.

Sessions were held twice weekly. Edmund W. Griffith, manager of Penn's Mineola branch office, was in charge of the meetings. A wide selection of tractor parts and cutaway displays, films and colored slides, and explanatory literature were aids to the program.

James Irwin and John Burley headed the Caterpillar staff on hand to discuss and demonstrate operating techniques. Other Caterpillar men working on the program included Fred Mathews, Dean Klingaman, Bob Johnson, Bob Meyer, Roger Williams, and John Tschantz. William Busch, district representative for Caterpillar, also participated in the program.

An outstanding feature was a panel comprised of Caterpillar representatives who, with James Humphrey, service manager of Penn's Mineola office, answered questions submitted.

The school, which received enthusiastic support from the Operating Engineers Local of Nassau and Suffolk counties, was planned and conducted by the Mineola branch office with the cooperation of H. O. Penn Machinery Co. officials. Ralph L. Johnson, president, and R. E. Reed, general sales manager, appeared briefly on the program.

Curing Compounds for Tilt-Up, Precast Work

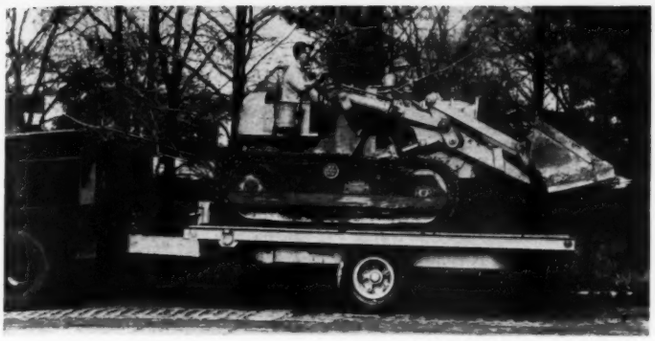
■ A line of products used for tilt-up and precast-concrete construction is discussed in literature from the Servicised Products Corp., 6051 W. 65th St., Chicago 38, Ill. The literature describes curing and separation compounds, a sponge-rubber joint filler, and the company's Calk-Crete calking compound.

Servicised curing and separation compounds include Code 2861 compound, which is used for curing the concrete slab or casting platform. The compound provides both controlled curing of the tilt-up panels and positive separation from the casting slab. Code 2862, a separation compound for surfaces to be painted, prevents bonding and disintegrates quickly to permit early painting or finished treatment of the concrete surface. The literature also describes a low-cost separation compound and a resin-base curing compound.

The Cementone sponge-rubber joint filler described is reported to have the resilience, compressibility, and nonextruding qualities which make it suitable for sealing tilt-up joints. It is neutral gray in color.

The Calk-Crete calking compound is a cold-applied rubber-base compound used for sealing over the joint filler in vertical joints or tilt-up precast-concrete construction.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 293.



This new Birmingham trailer is controlled by a hydraulic oil cylinder to tilt slowly and smoothly.

Trailer Tilts Smoothly By Hydraulic Control

■ An improved hauling trailer with a tilting top has been marketed by the Birmingham Mfg. Co., Inc., Second Ave. and Eleventh St., S., Birmingham, Ala. The new feature of this unit is that the trailer bed tilts slowly and smoothly for loading or unloading because its movement is controlled by a hydraulic oil cylinder. The new Birmingham tilting trailer is recommended for contractors who have no truck-tractor or low-bed trailer for use in moving equipment.

The trailer is easily operated by one man. In loading, one man pulls the safety pin, tilts the bed, drives the load on, and replaces the safety pin. In unloading, the safety pin is pulled and the load driven off as the bed slowly tilts. The trailer is hauled by using a pintle hook on the rear of any truck of 1½ tons or more capacity.

Five models of the tilting trailer are available. Load ratings range from 4 to 10 tons. The decks are 14 feet long and from 72 to 95 inches wide.

For further information write to the company, or use the Request Card at page 18. Circle No. 282.

Paving-Breaker Tools

■ Its line of pneumatic tool accessories is summarized in a booklet from Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. Paving-breaker tools shown include standard and heavy-duty moil points and narrow chisel bits. The Sabur point, designed to direct the force of impact so that there will be less kick-back and no sticking, is also illustrated.

Other tools described include the standard 3-inch chisel bit suitable for cutting softer concretes and asphalts and for digging in substances too soft for efficient moil-point work. The concrete buster is used for breaking rock in concrete with heavier breakers where the use of explosives is impractical. The asphalt cutter is designed for cutting asphalt and similar material. A digging chisel, suitable for deep digging and cutting of shales, hardpan, and asphalts, is also illustrated. A frost wedge shown is used for frozen ground.

Also described and illustrated are a broaching tool for leveling out uneven surfaces, a pipe driver, a rod or pin driver, and a brick-removing tool. Drawings and size specifications are included in the folder.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 228.

Scaffolding Equipment

■ A wide variety of scaffolding equipment is described in literature from Bil-Jax, Inc., Archbold, Ohio. The literature stresses that Bil-Jax towers are designed and built for fast erection and maximum safety to workers. All parts are made of steel tubing, and all joints are electrically welded.

The basic tower unit consists of two end frames and two pairs of cross braces. With the aid of insert pins, structures of a considerable height and unlimited length can be built. Flexible and interchangeable, the Bil-Jax units can be set up to give working access around and under obstructions. The manufacturer reports that no single piece is too heavy for one man to lift.

The booklet discusses standard end frames and their applications, putlogs and accessories, casters and base plates, guardrails and posts, and braces and miscellaneous accessories. A manual swing scaffold, a powered stirrup, a maintenance trestle, and maintenance accessories are also covered. The data includes results of laboratory load tests.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 262.

Portrait in Print

Morris Adelstein: Contractor and Optimist

Morris Adelstein, president of Northwest Engineering Co., Denver, Colo., and Rapid City, S. Dak.

THOSE WHO ARE worried about the future of the construction business and its role in national affairs would undoubtedly be cheered by Morris Adelstein, president of the Northwest Engineering Co., Denver, Colo., and Rapid City, S. Dak. Adelstein, head of a sizable Rocky Mountain outfit which did $8,000,000 worth of contracting last year, is a professional optimist.

From the time lightning struck his construction camp on the first night of the first job he ever undertook, killing one man and wrecking the camp, he has always had the same outlook. Even last December, lying in bed in Denver's General Rose Hospital with a crushed vertebra, he could still turn to his wife, Bertha, and smile, saying, "It couldn't have happened at a better time. This is a terrible month for contracting."

Even though his spinal column narrowly missed being damaged in an automobile accident, Adelstein managed to smile as he looked about the walls of his hospital room decked with cards from friends, contractors, engineers, construction men, and office girls. "This is getting a rest the hard way," Adelstein said. Characteristically he added, "Still, it's a rest, and my doctor says the accident will add ten years to my life!"

He had just put the finishing touches to a speech about the contracting business called, "Bids, Bidders, and Bums," a speech he originally made in Colorado, and which his son, Stanford, was set to deliver in place of his father at the annual Associated Contractor's meeting in Huron, S. Dak.

Bids, Bidders, and Bums

This speech, Adelstein's own impression of the contracting business, is based on knowledge which he gleaned from his own cost accounts. In making it, Adelstein uses a series of concentric circles, the largest of which represents the one original dollar of a contractor's income. Then, in a series of logical steps, the smiling man with graying hair and horn-rimmed spectacles — looking like the prototype of the professor, which he once was—begins to tear this dollar apart.

Insurance, old-age benefits, unforeseen conditions take their toll. Money is invested in the business, salaries have to be paid, and the job equipped. Equipment costs are calculated. Materials have to be

purchased. By the time Adelstein finishes his speech, the next-to-last concentric circle has been torn away to expose a small remaining six cents.

"That's supposed to be a contractor's take-home pay," he says. "But of course we haven't figured what income taxes will do to that six cents, have we?

"But that six cents isn't really important; not nearly as important as the other 94 cents," Adelstein adds. "Unless every penny of that 94 cents is managed properly, it doesn't take much imagination to see the small gap that exists between being a bidder and becoming a bum."

Northwestern's president has strong feelings about the maxim "know your costs".

"Suppose you're building automobiles," Adelstein said, "and you get tooled up for the job, order materials, and begin manufacturing. By and by you have automobiles to sell. If you're a good businessman, you know your costs. Then you add on what you believe is a fair profit and that, along with taxes, is the price of your car.

"But contracting is one of the few businesses in which you have to set a price before you start manufacturing. If you set the price too high, you don't get any work. Set it too low, and you leave money on the table and maybe lose your shirt. Even if you set it just right, it may not work out. Wages can increase on a long-term job, or you may run into unforeseen difficulties.

"Smart contracting is simply good business," Adelstein stated. "Cut out all the undetermined factors, and, if you can, make them constant. Try to find just what a piece of equipment will do, how much work an operator will deliver, how much the unit costs are. As you become more efficient, you reduce the intangibles."

Current Problem

Adelstein also has rules for the present-day situation. Despite a rise in contract costs, a fall in contract prices, increased competition, and the mounting cost of equipment and labor, Adelstein holds that a contractor can keep his volume up and increase his efficiency so that these pressures will be minimized. Developing better men for their jobs and getting better equipment is important, according to Adelstein. In competitive contracting, obsolete equipment cannot do the same type of job as late-model machines.

Practicing what he preaches, Adelstein is one of the most ruthless contractors in business as far as equipment is concerned. When Northwestern's management realized that the equipment at its disposal on a recent airfield paving job near El Paso, Texas, was not enough to meet specifications, Adelstein flew to Los Angeles to select modern machines for the job. He picked out the paving equipment he knew would meet specifications, make better time, and do the job more economically. Today, the job is in the black and ahead of schedule.

Although he is tough as far as equipment is concerned, Adelstein has a completely different attitude toward his men. He gets production from them by showing them he wants them to stay with the organization. He was one of the first contractors in the nation to establish a a pension plan for his employees. All men with the firm for two years are fully covered by company-paid insurance, in addition to having routine compensation insurance. A special annuity plan gives each five-year employee a participating interest in benefits. Bonuses are high to key people who have done good work.

The Hard Way

Adelstein pulled himself up through the construction business the hard way. While still a senior in college, he spent a summer working on a bridge construction job, earning a total of $1.75 per ten-hour day. It was at this time that he decided to be in the contracting business.

Born in Des Moines, Iowa, Adelstein had plenty of chores to keep him busy while he was growing up. In 1916, he graduated from Highland Park College with all liberal arts credits, plus a degree in civil engineering. Later, he attended State University at Iowa City for a Master's degree. Then for two years, he taught school in Iowa. With the advent of World War I, he broke into the construction industry.

Serving with the Army Engineers in France for 18 months, Adelstein took part in the tough St. Mihiel and Verdun campaigns. After the war, he took a job as design engineer for the Iowa State Highway Commission in Ames, Iowa, then moved to South Dakota, because of his mother's illness, and took the job

of county engineer for Jackson County. For several years he worked around Kadoka, moving on to a project engineer's post for the state of South Dakota.

Meanwhile, Adelstein was working practically day and night as both contractor and engineer. When his engineering duties were finished for the day, he went to work analyzing the contractor's production methods, calculating costs, and playing around with ideas about doing the work faster and more economically.

Then in 1922, an old friend, L. A. Pier, of Belvedere, S. Dak., heard of Adelstein's desire to get into the contracting business and arranged a $7,000 loan to the engineer. With this capital, Northwestern Engineering was formed. Today, Adelstein's former partner is the city engineer of Marshalltown, Iowa.

Adelstein moved into the contracting business with the same enthusiasm tempered by caution which he still exercises today. For weeks on end he failed to land a contract and then, after numerous disappointments, Northwestern Engineering Co. was awarded a combination grading and bridge job between Wasta and New Underwood, S. Dak. Even though lightning wreaked havoc on the camp the very first night, Adelstein went on to guide the company to its present success.

His first piece of equipment, a concrete mixer for the bridge work, is now a company memento. Its price was $100, and Adelstein arranged to take it over for a down payment of $10 and payments of $10 a month. That summer, he poured $16,000 worth of concrete through the mixer, making the machine pay for itself. As World War I surplus equipment became available about that time, Adelstein slowly began adding needed items to his stock of equipment.

Adelstein speaks fondly of those days. "I'd bid a job," Adelstein said, "and once in a while I'd land one. If there were structures, I'd act as my own superintendent and build them. The dirt work went to subcontractors. In those early days, Adelstein used to be called "The Suitcase Contractor", for on a job 5 miles long, the company often had 8 or 10 subcontractors on the dirt work. Adelstein said, "I guess when Northwestern landed a contract, they expected me to parcel out the earthwork from my suitcase!" When the new company was growing, Mrs. Adelstein stayed in the rough construction camps, kept the books, and even helped cook for the men.

"She deserves enormous credit," said Adelstein. "She helped to raise that business as if she were raising a child. And it was pretty rugged too."

Northwest Engineering Co. has come a long way since then. Two big jobs on the Pennsylvania Turnpike were the first of many huge projects the company has done. In the defense years and during World War II, Northwestern did most of the construction work at Ellsworth Air Force Base near Rapid City, S. Dak. It built the first unit of the Valley Highway near Denver, the biggest single contract ever awarded by the Colorado State Highway Department. The company now does all types of highway work, as well as work on tunnels, sewers, water lines, and buildings. Not once since the first job was undertaken has the company been without a contract. While the organization's main office is still in Rapid City, it has an affiliate company, the Woodward Construction Co., located in Rock Springs, Wyo.

Today, the Adelsteins make their home at 2295 Monaco Parkway in the mile-high city of Denver. Like their father, the Adelstein boys are turning to the engineering profession. Stanford, a civil engineering student at Colorado A and M, is a senior, and Robert is a freshman in the same school, majoring in the same subject.

Despite the enormous amount of time spent on his business, Adelstein has time for two hobbies. He reads detective magazines by the score, and he likes to help children. He is on the executive board and is chairman of the building committee of General Rose Memorial Hospital, a member of the board of trustees of the National Jewish Hospital, and vice president of the national executive body of the National Jewish Home for Asthmatic Children.

A past president of the Associated General Contractors of Colorado, he belongs to the American

Legion and holds membership in a number of engineering societies as well as fraternal and other organizations.

In addition to keeping busy with company problems and personal interests, Adelstein also works hard to further contracting in general. Cooperation between engineers and contractors, he believes, is fundamental. According to Adelstein, "The young engineer who believes an average contractor to be anything but an ethical businessman is probably the victim of a gap in education. Contractors are becoming more and more permanent businessmen in their communities. And if an engineer works closely with these contractors, he can come closer to getting the job done right than he could through a literal enforcement of the specifications."

Adelstein also has a word or two about engineering salaries. He thinks it is wrong for a man to have charge of "a job running into hundreds of thousands of dollars and receive less pay than a catskinner on that job". Along with his favoring higher pay for engineers, Adelstein sees AGC participation in engineering scholarships as being highly desirable.

However occupied Adelstein is kept with business problems, philanthropic work, or the status of contracting, he always looks on the bright side of things. This optimistic approach to life stood him in good stead one day some years ago when he was building a new road near Hays, S. Dak. Traffic in that area was generally light, and no detour had been provided. The occasional passing cars bumped their way slowly over a very rough subgrade. Then suddenly there appeared a cavalcade of vehicles carrying about 2,000 sightseeing dignitaries headed by the then President of the United States, Calvin Coolidge. Adelstein, with a broad smile of greeting, waved them on over his job as if it were a paved superhighway. He swears that Cal smiled back at him. THE END

Fuller Mfg. to Operate Shuler as a Subsidiary

With the acquisition of Shuler Axle Co., Louisville, Ky., The Fuller Mfg. Co., Kalamazoo, Mich., is one of the largest manufacturers of units for off-highway trucks and construction equipment. Shuler has been in business for 35 years, making Shuler front axles for trucks, tractors, and construction equipment as well as tubular, square, and I-beam rear axles for transport trailers, etc.

Fuller Mfg. Co. will operate the Shuler manufacturing facilities as a wholly owned subsidiary.

One-Man Chain Saw

■ A completely new chain saw said to be light in weight, fast cutting, and easy to handle, has been announced by the Homelite Corp., 54 Riverdale Ave., Port Chester, N. Y. Designed for every type of cutting, the new 22-pound Homelite Model 17 chain saw offers 3.5 brake horsepower.

According to the manufacturer, the Model 17 slices through an 18-inch tree in as little as 18 seconds and easily fells trees 4 feet or more in diameter. Features include an automatic clutch, all-angle diaphragm carburetion, positive chain lubrication, quick starting, weatherproof ignition, rugged and simple design, and dependability.

The new Model 17 22-pound Homelite chain saw.

Straight blades are available in sizes from 15 to 36 inches; plunge-cut bow-saw attachments, for one or two-man operation, are available in 14 and 18-inch sizes.

For further information write to the company, or use the Request Card at page 18. Circle No. 191.

Carver Sales Executive

L. C. Lane has been named midwest regional sales manager by the Carver Pump Co., Muscatine, Iowa. He will have headquarters at Lafayette, Ind., and will maintain close contact with the company's distributors and sales representatives. Carver manufactures centrifugal pumps for the construction, industrial, and irrigation fields.

Celotex form liner is shown on sloping forms used in dam construction.

Absorptive Form Liner Improves Concrete Finish

■ Literature is available on an absorptive form liner made by the Celotex Corp., 120 S. LaSalle St., Chicago 3, Ill. The Celotex form liner is said to produce concrete surfaces that are comparatively free of voids and pits and have greater wear-resistance and better appearance.

The booklet explains that normally, when concrete is placed against conventional wood forms and vibrated to insure a dense mix, air bubbles and excess water are driven to the sides of the form. Because wood forms are nonporous, these free agents become entrapped just at or below the form surface and cause undesirable pits and sand streaks to appear on the finished surface.

The absorptive form liner eliminates the air and excess water in the concrete through absorption. This porous form lining material is a cane fibre board felted to a predetermined density and surface-impregnated with a specially prepared compound that controls the rate of air and water absorption.

In using the form liner, no oil or other treatment of the form is required. Within one to four days after the concrete placing is completed, the forms are stripped and the liner is peeled off and discarded. The absorptive form liner is made in sheets 4 x 8 feet x 3/8 inch.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 316.

Concrete Sawing Equipment Names Foreign Sales Firm

The foreign sales of Concut concrete sawing machines and the Jointmaster sawing machines will be handled by the Impex Corp., Rockefeller Center, New York, N. Y., for Concrete Sawing Equipment, Inc., Arcadia, Calif. Concrete Sawing Equipment is also exclusive national distributor of Foothill blades and has named the Impex organization to handle the foreign sales of this product.

Use the Request Cards Between Pages 18 & 19 To Obtain Further Information or Printed Matter on Any Product Advertised or Described Editorially in This Issue

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The new Model 20 Shoveloader is a front-wheel-drive unit for bulk material handling.

Redesigned Boom Arms For Tractor-Loader

■ The newest addition to the Shoveloader line is the Model 20 tractor-loader with 12-cubic-foot bucket. It was recently announced by the Baker-Lull Corp., 314 W. 90th St., Minneapolis 20, Minn. The new unit digs, loads, carries, and dumps through its front-end loader boom arms. The design of the boom arms, according to the manufacturer, allows a full-circle view at all times, with lift action accomplished at no risk of injury to the operator. The bucket suspends in low position during travel so that there is full forward visibility and so that spilling is avoided.

The loader bucket lifts a 1,500-pound load to a 7-foot height. The 90-inch turning radius of the machine permits close work both inside and outside. Adjustable lift forks and special bucket and crane hook accessories interchange with the loader bucket for other jobs. Gasoline-driven, the Model 20 has five speeds, four forward and one reverse. The maximum travel speed is 14 mph.

For inside work, special catalytic equipment is available that destroys dangerous exhaust gases. A spark-arresting muffler and a Protectoseal fuel tank are standard equipment.

For further information write to the company for Form No. AD-60, or use the Request Card at page 18. Circle No. 318.

Electric Impact Vibrators For Bins and Forms

■ A catalog announcing a new line of electric vibrators for bins, concrete forms, and screens has been released by the Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland, Ohio. The brochure contains factual and technical data on the new line of vibrators known as the Cleveland Model RC and Model MC.

According to the manufacturer, the new Cleveland electric vibrator will handle any granular material including sand, gravel, cinders, coal, and wood chips, in an almost noiseless operation, with heavy impact for its weight. A totally enclosed housing seals the unit from moisture and dust. The Model RC electric vibrators are available in three-phase ac only, in a choice of voltages from 110 to 550 volts. The Model MC vibrators are designed for light-duty applications.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 216.

Excavator Specifications

■ Osgood-General, P. O. Box 515, Marion, Ohio, manufacturer of power excavators, cranes, and material-handling equipment, announces the release of specifications on their new crawler-mounted 2-cubic-yard Model 920 excavator. The machine converts to shovel, dragline, clamshell, hoe, and crane service.

This four-page specification includes all dimensions, lifting capacities, and weights of the machine for its different classes of service.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 184.

What Makes a Good Project Engineer?

In seeking to find an answer to the question "What makes a good project engineer?", CONTRACTORS AND ENGINEERS *went to Wyoming, a state where engineering managers on highway jobs, often cut off from the main office, are forced to exercise a high degree of independence and responsibility in their work.*

There, three of the state's experienced highway executives, J. R. Bromley, R. G. Stapp, and T. D. Sherard, were brought together for an informal discussion concerning the qualities every good project engineer should possess. Mr. Bromley, superintendent and chief engineer of the Wyoming State Highway Department, was once a project engineer, as was R. G. Stapp, Wyoming construction and maintenance engineer. Mr. Sherard, secretary of the Wyoming organization, is an engineer with 16 years of service with the highway department, the last five years of which were spent in administration and personnel management. Here are their views on the question:

Q.: How important is the project engineer in a state highway department? Let's start with you, Mr. Bromley.

A.: "I believe there's no more important position in the department than that of project engineer. A man in this job is the chief liaison between the planning and construction of a job. No plans, however cleverly drawn, are any better than the resident engineer who builds the completed project.

"He has much more responsibility than you may think. In this state—and I'm sure it's almost universal—a project engineer's judgment has a direct influence on bid prices. In this respect, it has an effect on the whole structure of the contract system. His job is tremendously important—don't you think so, Ross?"

Stapp: "Definitely. I'd like to add that I think the project engineer is one of the principal teachers in the department. He's the man who must train his subordinates. He must show his soil men newly introduced techniques. And he must check on the work of his survey parties and teach them the importance of varying degrees of tolerance in different kinds of work.

"If a project engineer is really good, he can do much to help the contractor's personnel to work more efficiently. Sometimes he may even suggest cost-cutting methods that will benefit a contractor."

Sherard: "You may have overlooked another point. In most cases—at least in this state—our project engineers are also public relations managers. No other single employee has more dealings with people who might be termed 'our customers'. A project engineer's judgment, diplomacy, tact, and his ability to explain a point of view practically determine what many people think of their highway department."

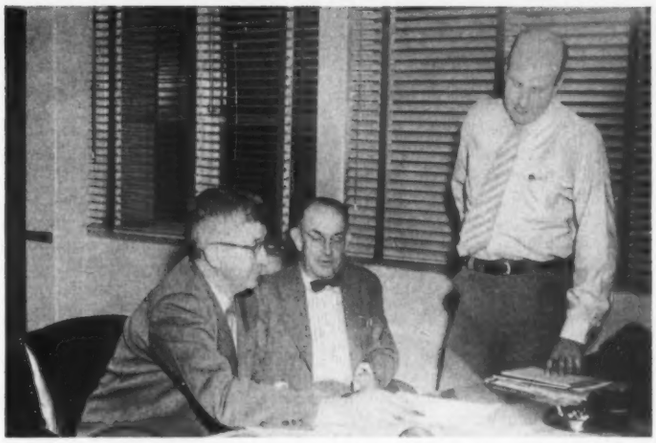
Q.: Since a project engineer's job is this important, do you think it's a stepping stone to something better?

Stapp: "It certainly is. At the annual meeting of the American Association of State Highway Officials, there were a number of highway executives who had come up through the ranks as project engineers. There's no better springboard to a better job than a project engineer's post."

Q.: Then in selecting men for these jobs, how would you rate professional ability, education, and experience?

Bromley: "I'd rate them as very important factors, only equaled in

Three state highway officials discuss the qualifications—personal and professional—of a good project engineer



R. G. Stapp, construction and maintenance engineer; J. R. Bromley, superintendent and chief engineer; and T. D. Sherard, commission secretary, of the Wyoming State Highway Department, discuss the qualifications of a good project engineer. *Ray Day Photo*

importance by a man's personality and attitude."

Sherard: "I agree. The saddest sight in the world is the man who comes from college with a brilliant education and yet has a negative personality. He has enormous potential. But this can never be developed unless he cultivates a capacity for liking and respecting other people, the ability to work with them, and an understanding of their problems and viewpoints."

Stapp: "Yes, these things are fundamental—as important as a man's ambition, aggressiveness, and sense of responsibility.

"As far as I'm concerned, give me a man who makes errors of commission instead of errors of omission. In the old days, there used to be a saying, 'Do something, even if you do it wrong.' Nobody likes to do things wrong, of course; but the man who gives his district engineer and his department head the most trouble is the man who's not aggressive, who's afraid to act, who doesn't do things which need to be done.

"We begin to watch a project engineer with interest when he's working on a tough contract job and weeks go by without requests for decisions being relayed from the field to the main office. You don't have to worry about a man like this who's showing aggressiveness and initiative. It's far simpler to give this man good advice and guidance, and curb him occasionally when he's wrong, than to try to lead a man who lacks ambition."

Bromley: "We get into intangibles when we talk about a thing like that. I don't believe any of these qualities can be separated. Take the matter of good judgment, for example. This is a vital factor in the way a man does his job. Yet the man's ability to use his judgment depends on his background and is tied up with his experience, education, and personality."

Stapp: "It might be well to dwell just a bit more on a man's experience. It's tremendously important in his development. How can a man direct the Bureau of Construction in a highway department if he hasn't mastered practically every phase of that broad subject? How can he say than an asphalt mix is good or bad without having run plenty of asphalt mixes himself and checked their

(Concluded on next page)

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characteristics under laboratory and traffic conditions? He simply can't.

"Our organizational setup here in Wyoming broadens the experience of a project engineer. We have a 5,000-mile highway system, 5 districts, and 22 project engineers. Two of these men have more than 30 years' experience, three have between 25 and 30 years, and five have between 20 and 25 years. The average experience level of the group is 17 years.

"These men are headquartered in certain cities for long periods of time. They have to handle anything which comes up in their vicinity: a bridge, an asphalt job, the grading of a secondary road, or even a major 4-lane divided highway like the one we just finished south of Cheyenne. They have to handle problems of location, investigation, research. Out of all this comes the thing called experience, and no man is good until he gets it."

Sherard: "You'll find, too, that the man who has plenty of experience is interested in his work. He loves his job. This has a great deal to do with his ability to get along with other people—another asset for a project engineer. He's also got to have sound judgment under enormous pressure. The more experience he can cram into his background, the more he'll be able to stand up under the demands of his job."

Bromley: "In this regard, he should be in control of his temper all the time. This will help him to be factual and unprejudiced in his judgments. The very essence of good engineering is the ability to analyze given situations and come to sound conclusions on the basis of the evidence presented. All these things—along with a man's appearance and his health—have a bearing on his fitness for a project engineer's job."

Q.: What is your conception of the relationship between a project engineer and a contractor?

Bromley: "That's the $64 question! Still, I believe the greatest fallacy which still persists is that contractors are the natural enemies of engineers, and vice versa. Nothing could be further from the truth.

"We've all seen the excellent progress made by the AASHO in its joint committee work with Associated General Contractors of America. AGC has done much to standardize designs, lower costs, and promote harmony, not only with highway departments, but also with Federal contracting agencies.

"I'd like to think of the basic relationship between engineers and contractors as being that of a partnership. The best possible job will be done when both work together.

"The great majority of our contractors here in Wyoming are highly ethical, honest, permanent businessmen. I know of some who've actually exceeded the letter of their specifications many times. But I wouldn't be making this statement complete if I didn't admit that there are occasional unfortunate exceptions. The good project engineer will be able to spot these and to deal with them. But he won't condemn the majority of contractors simply because a few have broken the rules."

Stapp: "I'll answer your question with a question: Can a project engineer afford to have a contractor lose money on the job? I believe not, assuming that the contractor's bid prices are sound. No project engineer and no state highway department can afford it.

"By the same token, no contractor can afford to do slipshod work and expect to get by. The contract system is supposed to provide, along with competition, better work for less money, thus making the public dollar stretch further. If the work is slipshod, this relationship is upset. Furthermore, I believe that no contractor can afford the questionable luxury of having a name for bad work.

"If I were a project engineer again, I'd want to conduct my affairs in such a way that I'd be known as a man able to get excellent work. I'd also want my contractors to know they could depend on my judgment so that they wouldn't be forced to add contingent costs to any of their bids. One is not as far from the other as you might believe."

THE END

Data on Design and Use Of Two-Cycle Engine

■ The application of the small two-cycle engine to power equipment is discussed in a new booklet. The booklet is a reprint of a speech delivered at a meeting of the Society of Automotive Engineers by Sheldon D. Pollow, chief engineer of the Power Products Corp., Grafton, Wis.

It includes 22 illustrations describing applications, principles of operation, and engineering and mechanical features of two-cycle engines, particularly as relating to engines manufactured by the company.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 238.

The Clarktor-75, a new towing tractor, is powered by an 82-hp Chrysler 6A engine.

Wheel-Type Tractor Pulls Heavy Loads

■ A new pneumatic-tired towing tractor with a maximum drawbar pull of 7,500 pounds is available from the Clark Equipment Co., Battle Creek, Mich. The Clarktor-75 tractor has an 82-hp Chrysler 6A engine with fluid coupling. The manufacturer states that this combination provides power for heavy-duty operations as well as for delicate handling to prevent damage to fragile loads.

The unit has a planetary-drive axle that permits maximum transmission of power to the drive wheels with reduced wear in the drive train. The tractor has four-wheel brakes. Standard on all wheels are 7:50 x 16 eight-ply tires. Easy accessibility for service and maintenance of engine components is permitted by a one-piece hinged hood and brace.

Other features of the tractor include a two-man seat with back-rest, overhead suspension of clutch and brake pedals, and full front fenders and running boards. Standard equipment includes two sealed-beam headlights, one tail light, a Hobbs Hour Meter with pressure switch, and a Universal coupler with hand release.

For further information write to the company, or use the Request Card at page 18. Circle No. 319.

Data on Excavator-Crane

■ A catalog describing its improved 15-ton-lift-capacity ½-cubic-yard Model 205 excavator has been released by the Koehring Co., 3026 W. Concordia Ave., Milwaukee 16, Wis. The catalog describes operating features of the machine when it is equipped as a shovel, hoe, crane, or dragline. The unit is available either crawler-mounted or as a truck crane with a maximum road speed of 32.6 mph.

To obtain this catalog, write to the company, or use the Request Card at page 18. Circle No. 206.

Describes Steam Machines For Equipment Cleaning

■ A line of steam vapor and high-pressure steam and water combination cleaners for use in equipment maintenance is described in literature from the Malsbary Mfg. Co., 845 92nd Ave., Oakland 3, Calif. Of particular interest to contractors are two heavy-duty models.

The Series 300 cleaner may be used by one or two workmen at a time. It is equipped with one steam or hot solution gun and one high-pressure water gun which can be operated simultaneously. These units have large-capacity fuel and solution tanks designed for continuous operation. Output of these models is up to 900 gallons per hour at pressures up to 400 psi. Operating temperature is 325 degrees F. The Series 500 cleaners provide two steam or hot-water guns and two high-pressure water guns and is reported to perform twice the amount of work done by the Series 300. Fuel and solution tanks are designed for continuous 2-gun operation. Output of this unit is up to 2,100 gph at pressures to 400 psi. It works at temperatures to 325 degrees F.

The units perform five cleaning actions. The high-temperature steam cleaning removes grease, road oil, and tars. High-pressure cold water is available for rinsing and for removing caked mud and dirt. There is hot water to remove mud and for use with de-icing equipment. The units also offer low-pressure wet steam and warm water.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 253.

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief extracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Accidents to "Riders" On Company Vehicles

The appellate courts have frequently been called upon to determine the liability of a corporation for injuries to persons who have been permitted by one of its officers to ride in a car or truck for social or other purposes not connected with the company business errand upon which the vehicle is principally engaged. At least two of the cases arose in the construction industry.

A construction company was building bridges in western New York, under supervision by its vice president and secretary, Mr. Fichter. On a return trip to New York City, where the company offices were located, he invited a youth to ride with him, and the boy was injured. The Appellate Division of the New York Supreme Court decided the company was not liable, declaring that Fichter's status as officer of the corporation gave him no implied authority to carry passengers for his or their own pleasure or convenience. (Natell v. Taylor-Fichter Steel Construction Co., 257 App. Div. 764, 15 N. Y. Supp. 2d 327.)

In a Kentucky case, two brothers and their wives owned a construction company. One of the brothers, president of the company, directed an employee to drive a truck on company business to Louisville and to take the president's daughter and other children in the truck for the ride. The daughter was killed, through the truck driver's negligence. The Kentucky Court of Appeals decided that the corporation was not liable, in effect declaring that the president of a construction company has no more authority to bind it in a matter not pertaining to corporate business than has a subordinate employee. (Koch's Administrator v. Koch Bros., Inc., 119 S. W. 2d 1116.)

The two cases above mentioned were cited by the Missouri Supreme Court in a recent decision rendered in a case that arose outside the construction industry, but involving the same legal principles. (Roth v. J. N. Roth & Co., 253 S. W. 2d 802.) There, the president of a company drove his own car on a business trip for the company, taking his wife along wholly for their mutual pleasure, and she was injured in a collision. The court said that even if the accident was due to his negligence, the company was not liable for the injury.

However, the Missouri court and decisions from other states cited by it seem to recognize that a corporation's immunity to liability is limited to accidents caused by ordinary negligence of the driver, and that liability may exist if a "rider" is injured through wanton or gross negligence of the driver.

Bidder's Death Before Signing Up Released Bid

THE PROBLEM: *A successful bidder failed to sign a contract to construct a sanitary disposal system, the bidder having died within the time allowed for signing. Was the surety on his bid bond liable for the failure?*

THE ANSWER: No. (Central Contra Costa Sanitary District v. National Surety Corp., 246 Pac. 2d 150, decided by the California District Court of Appeal, Second District, Division 1.)

The court did not say that a binding contract may not arise upon acceptance of a bid under given circumstances, but determined, on consideration of all the facts in this case, that it was understood that signing of a formal contract was essential to a binding bargain; and that death of the bidder, while he was not in default as such, automatically annulled the bid.

On opening of bids, Contractor Gogo's proposal was found to be lowest and it was accepted by the sanitary district, whose officers were directed to execute a contract with him.

A bond for more than 10 per cent of the price bid had been posted as a guarantee that Gogo would enter into a contract within ten days after notice of acceptance of the bid. The bond was forfeitable if that condition was not lived up to.

Mr. Gogo received the notice one morning and died suddenly in the evening, without having signed the contract, although he indicated that he intended to do so.

No demand was made by the District that the Gogo estate execute the contract or do the work. Another call for bids was issued and a contract consummated with the lowest bidder at $486,036. The District sued the surety on the Gogo bid bond for $57,267, the amount by which the contract price on the second award exceeded the amount bid by Gogo. The District lost the suit.

First, the Court of Appeals rejected the District's contention that a binding contract arose when Gogo was notified that his bid had been accepted. The court noted that the bid and its acceptance contemplated that the formal contract would be accompanied by a bond for 50 per cent of the contract price to secure payment for labor and materials and a performance bond for 100 per cent. The proposal bound the bidder to execute "a contract with necessary bonds".

On the second question involved, the Court of Appeals followed the general rule that death of a party terminates a contract by him to perform services if the agreement was such that the other party relied upon performance by the decedent. The court pointed to the following facts as showing that the negotiations for a contract contemplated performance by the successful bidder and no one else.

The bidding spex stated that the competency and responsibility of bidders would be considered in making an award and prohibited assignment of the contract without the consent of the District. The notice for bids specified that a bidder should be regarded as undertaking to do all the work himself unless he named subcontractors he intended to use. Mr. Gogo named no sub-

contractors and thereby signified that he would perform the contract.

Death having excused performance of the proposed contract, it followed that the surety was released from liability on the bid bond.

State Delayed Clearing Site

THE PROBLEM: *A state highway contractor took a job knowing that the site was obstructed by poles and houses but reasonably expecting that such arrangements had been made by the state as would permit early removal of the obstructions. But the arrangements were only in initial negotiation stages between the state and the owners of the poles and houses. (1) Did the state render itself liable to the contractor for the rental value of idled equipment and labor force? (2) In computing the contractor's collectible damages based upon resulting differences in anticipated and actual construction costs, was it proper to accept the contractor's itemized bid figures as reflecting the costs, the state failing to contradict those figures?*

THE ANSWERS: (1, 2) Yes. (Grandview Construction Corp. v. State of New York, 124 N. Y. Supp. 2d 10, decided by the New York Court of Claims.)

The court noted that due to the state's continuing delay, the contractor constantly had to revise its construction plans. "Its anticipated progress schedule became only a memory of a fond hope."

A decision of the New York Court of Appeals (Wright & Kremers, Inc., v. State, 263 N. Y. 615, 180 N. E. 724) was cited as showing that the state was liable for failing to diligently clear the job site.

In accepting the contractor's figures, the court said that it was aware "that in large construction contracts there is often considerable variance, through hazards encountered in the trade, between planned and actual cost". But the court was bound to accept the figures for the following reasons:

"Contractors, if they are to remain long in business, must be expert in analyzing job requirements and breaking them down into units of cost. The planned cost . . . was taken ultimately from the itemized figures submitted by the claimant in its bid and therefore certainly not in anticipation of litigation. Further, the state offered no evidence to contradict claimant's figures. Its excuse that such contradicting evidence is difficult if not impossible to obtain is fatuous."

City Waived Delay

THE PROBLEM: *A city sewer-construction contract provided that the contractor should not be liable for delays due to unforeseeable causes if the engineer extended time for completion on being notified by the contractor of the cause of delay, within ten days from beginning of delay. Was the contractor entitled to the benefit of an extension granted by the engineer without such notice having been given?*

THE ANSWER: Yes. As agent for the city, the engineer could waive the formal notice required by the contract. (Clarke v. City of Albany, 261 S. W. 2d 435, decided by the Kentucky Court of Appeals.)

Area Engineer Could Not Change Contract

THE PROBLEM: *The Government notified a contractor that one building would be eliminated and that a change order would be issued, crediting the contractor with the price bid on that building, including a proportionate share of overhead and profit. The contractor told the area engineer that he would consent if there should be no reduction in allocated lumber. The engineer agreed to that condition. Was the Government bound by the agreement?*

THE ANSWER: No. (Chalker & Lund Co. v. United States, 107 Fed. Supp. 734, decided by the United States Court of Claims.)

The court said that although the area engineer may have been the contracting officer's representative for limited purposes, there was no showing of power to amend the agreement without approval of the contracting officer.

Negligent Surveying

THE PROBLEM: *Was an Ohio statute that requires malpractice suits to be brought within one year applicable to a suit brought against a licensed surveyor for damages resulting from erroneously staking a building site?*

THE ANSWER: No. (Wishnek v. Gulla, 114 N. E. 2d 914, decided by the Ohio Court of Common Pleas, Cleveland.)

The court conceded that engineering is a profession, but not one of the professions which the Legislature had in mind when it fixed a time limit for starting malpractice suits.

Death Caused by Equipment Left in Public Place

THE PROBLEM: *A levee contractor left heavy earth-moving equipment unattended after working hours in a public place (a populous city section). The machines were without operative brakes, fueled, in gear, and with ignition switches unlocked. Evening after evening, various adults meddled with the equipment to see how it worked, until one of them negligently moved one of the machines, causing death to a person standing nearby. Did a statement of these facts show that the contractor was liable?*

THE ANSWER: Yes. (Zuber v. Clarkson Construction Co., 215 S. W. 2d 52, decided by the Missouri Supreme Court, Division 1.)

A Circuit Court judge in Kansas

City, where the accident occurred, had ordered dismissal of the suit without trial, on the ground that the facts charged, even if proved, would not show liability on the part of the contractor. But the Supreme Court reversed that decision.

The higher court reasoned: The persons whose curiosity drew them to the machines parked in a public place could not be regarded as trespassers, since they had a right to be there. The machine, although not in itself dangerous, was rendered so by the ability of an unskilled person to set it in motion. The contractor's knowledge that people were tinkering with the machines was enough to warn him that some one of them might set a machine in motion. Although "the machines have great economic importance and contribute immeasurably to the general welfare in the construction of public works, nevertheless, the effort or expense of devising and using locks, assuming the machines were not so equipped, or the taking of other precautionary measures rendering the machines immobile or inoperable, thus obviating . . . foreseeable danger, would seemingly be not too onerous or out of proportion to the hazard involved".

Contractor Denied Right To Extra Costs on Jetty

THE PROBLEM: *A stone jetty construction contract specified length, elevation above mean low water, width of the berm, and degree of side slopes. The only variables were measurements of the height of the jetty and the width at the bottom, which depended upon the distance of the sand level below mean low water. The contract called for a unit-ton price. When 200 linear feet of the 245 feet had been constructed, the engineer ordered work suspended to determine the discrepancy involved in building the jetty higher and wider than called for by the specifications. When work resumed, the contractor under orders stripped the excess stone and used it in extending the jetty to the contract length. Was the contractor entitled to collect $23,000 to cover standby charges incurred during the work stoppage and rehandling charges?*

THE ANSWER: No. (Seaboard Construction Co. v. Atlantic City, 204 Fed. 2d 163, decided by the United States Court of Appeals, Third Circuit.)

Two reasons barred the right to force payment of the claim: (1) The engineer was not given power to change the specifications. (2) Under a local statute requiring such contracts to be awarded under competitive bidding, the defendant city could not, and did not attempt to permit a departure from the contract specification of materials under which bids had been received. As to the engineer's powers, they were limited to policing "the work to insure that the specifications were being followed; he had no authority to change the plans".

Heavy Contractors Were Not "Commercial Carriers"

THE PROBLEM: *The Colorado Commercial Carrier Act imposed a ton-mile tax on commercial carriers. The statute defined "commercial carrier" as including one transporting property sold or to be sold by the carrier "or in the furtherance of any private commercial enterprise". Did the act cover heavy construction contractors on such projects as highways, irrigation systems, dams, sanitation and sewage disposal plants, public buildings, etc., so far as concerns the use of large trucks in moving necessary materials?*

THE ANSWER: No. (Colorado Contractors Assn. v. Public Utilities Commission, 262 Pac. 2d 266, decided by the Colorado Supreme Court.)

The court reasoned: The manifest intent of the law was to cover motor vehicle carriage of goods and merchandise in ordinary commerce. Possibly, if contractors constructed bridges, roads, and so forth with a view to selling them to public agencies after completion, it might be said that the contractors would come within the act. In actual practice, however, the heavy construction contractor moves materials on highways as his own property and not for resale but to incorporate them in integrated structures for public agencies.

Bulldozer Blade Damaged Automobile

THE PROBLEM: *A bulldozer was loaded on a trailer so that the blade extended two feet beyond each side of the trailer. There were no flags attached at the ends of the blade, and a motorist in overtaking and passing on the left-hand side, struck the blade and damaged his car. Was the owner of the bulldozer liable?*

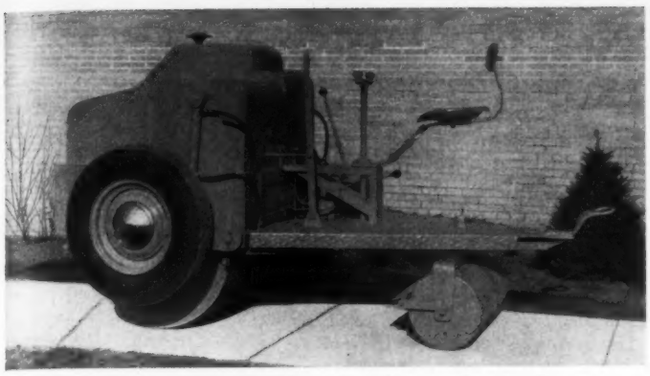
THE ANSWER: Yes. (Allgood v. Butler, 76 S. E. 2d 437, decided by the Georgia Court of Appeals.)

The court decided that the circumstances were such that the motorist was not at fault in failing to see the projecting blade.

Base Washed Away

THE PROBLEM: *Was a paving contractor liable for the cost of repaving a street on a residential project where paving washed away due to insufficiency of the gravel base which the owner had provided?*

THE ANSWER: No. (Givens v. Western Paving Co., 261 Pac. 2d 450, decided by the Oklahoma Supreme Court.)



The new Andwall 2-ton roller is designed to surface close to curbs and walls.

Two-Ton Roller Works Close to Obstructions

■ A 2-ton roller capable of surfacing within 1¼ inches of curbing, wall, or other vertical obstructions is announced by the Andwall Mfg. Co., Oconomowoc, Wis. This versatile roller will handle a variety of paving jobs, including those on alleys, parks, industrial plants, parking lots, service stations, and school yards. It is especially useful for patch work where ease of maneuverability and close work is important.

The unit has a hydraulic lift which raises the 36-inch 4,100-pound roller off the ground so that it can be trailed behind any truck. Wheels with pneumatic tires support the roller for quick transport from job to job.

The Andwall roller concentrates its weight on the main roller and provides a compaction pressure of 110 pounds per linear inch. The water drum capacity is 800 pounds, and the water tank holds 220 pounds. The roller is driven by an 11.2-hp 2-cylinder air-cooled Wisconsin power unit. There are no gears to shift and no complex clutch adjustments.

For further information write to the company, or use the Request Card at page 18. Circle No. 186.

Mechanical Stirrups for Staging Platforms

■ Mechanical stirrups for swing stages are illustrated in literature from the Albina Engine & Machine Works, 2100 N. Albina Ave., Portland 12, Oreg. The stirrups are shown in use on electric-powered and air-powered swing stages. Other products shown are Albina stirrups with a basket, transfer chains, adjustable I-beam rollers, and rigging, including cornice hooks, adjustable brackets, and outriggers.

In operation, the power unit of the Albina stirrup drives the drum up the wire rope in an average speed of 20 fpm. The power unit consists of two reductions—one worm gear and one spur gear—running in oil, and a standard ¾-hp General Electric reversible safety-brake motor, or an Ingersoll-Rand air motor. A 110 to 220 dual-voltage switch is located under the louver of the relay box.

An electric solenoid-operated brake gives the operator control of the stirrup at all times.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 263.

Metal-Gouging Torch

■ A new torch for heavy-duty work has been added to the line of cutting and gouging torches manufactured by the Arcair Co., P. O. Box 337, Lancaster, Ohio. Like all Arcair torches, the new Model J-5, using only electric arc and compressed air, is designed to cut and gouge all metals.

The new model features a solid one-piece insulated head that holds the electrode at a fixed angle for better electrode contact and less heat. A spring-loaded plunger which holds the electrode in place also acts as an automatic air valve. The air is on as long as the electrode remains in the torch.

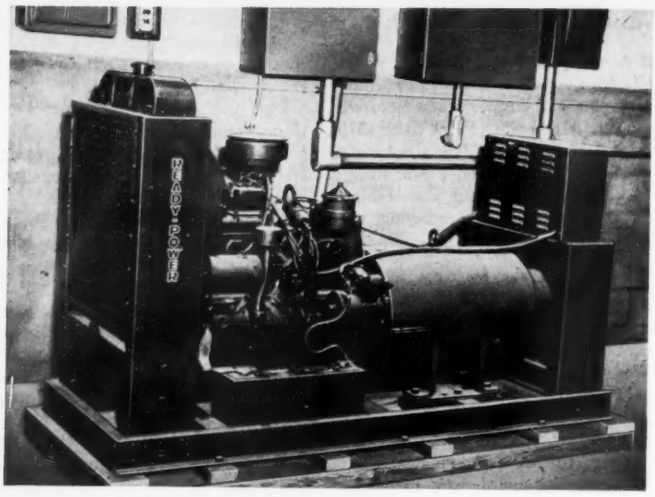
These features eliminate all hand grip controls and permit the torch to be operated in any direction or position without the necessity of adjusting the electrode angle and air controls or of changing the grip on the handle.

Two heads, one for ⅜-inch electrodes and one for ½-inch electrodes, are supplied with each torch and can be quickly interchanged.

Special features of the Model J-5 torch include the insulated metal hand shield and the heavy-duty concentric cable used. The torch is only 14 inches in length.

The new Arcair torch is suitable for removing excess metal from defective castings, for gouging out cracks in castings for re-welding, and for removing defective welds that might occur in ordinary welding operations.

For further information write to the company, or use the Request Card at page 18. Circle No. 189.



Ready-Power is offering a new line of Chrysler-engine-powered generators.

Line of Generators

■ A new power generator series is offered in 50, 30, and 20-kw ratings by the Ready-Power Co., 11231 Freud Ave., Detroit 14, Mich.

The Chrysler engines that power the generators feature sodium-cooled exhaust valves, air-cooled generator, by-pass thermostat cooling system, down-draft carburation, micro-babbitt bearings, and superfinished bearing surfaces. The units are said to be economical in fuel consumption and smooth and quiet in operation. A heavy base of welded structural steel allows easy installation and permanent alignment without the need of a special foundation. The readily accessible controls for both engine and generator are located in a single control cabinet.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 321.

Manual on Servicing Multipurpose Earth-Mover

■ A manual devoted to the maintenance, servicing, and repair of its mobile multipurpose earth-moving excavator and construction machine has just been issued by the Gradall Division of the Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio. Revised and enlarged, this quick-reference guide to good Gradall maintenance incorporates up-to-the-minute service recommendations and suggestions covering the company's improved Model M-2460.

With the aid of more than 100 how-to-do-it photographs and schematic drawings, the manual discusses simplified maintenance methods designed to help Gradall users secure top performance, maximum economy, and optimum utilization and life for this equipment.

The hydraulic system of the unit is briefly reviewed, its components discussed, their functions explained, and procedures for the adjustment and repair of these parts outlined. Supplementary data includes engine wiring diagrams, a graphic lubrication chart, and a comprehensive trouble-shooting check chart in tabular form covering 25 specific operating problems and giving the probable cause and remedy for each.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 265.

Line of Centrifugal Pumps

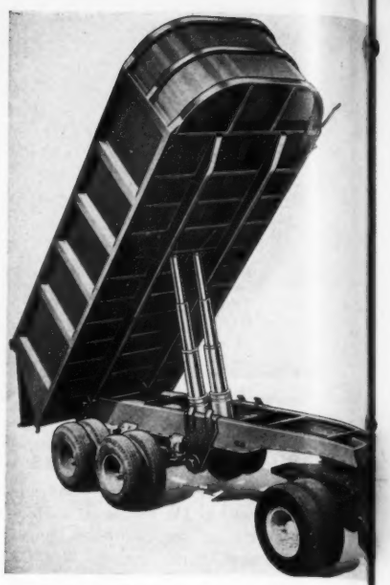
■ A line of self-priming centrifugal pumps is illustrated in literature from the Ohler Machinery Co., P. O. Box 687, Waterloo, Iowa. The Ohler Twin Prime pump line includes units ranging from a 2-hp 1½-inch light-duty pump through heavy-duty 3 and 4-inch pumps for larger jobs.

The Twin Prime pump features dual volutes said to assure continuous flushing of the pump case so that no mud or sand will settle in it. A longer volute discharge means higher efficiency. The pump design eliminates flapper and priming valves with no loss of efficiency. There are no jets to clog.

The unit has a 4-vane hydraulically balanced trash-type impeller and a replaceable flat-ground wear plate.

All engines used are 4-cycle Wisconsin, Briggs & Stratton, or Lawson units. The pump is available mounted on skids, steel wheels, and rubber-tired wheels at extra cost.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 248.



Perfection dump-body hoists are designed to withstand the stress and strain of unbalanced loads.

Dump-Body Hoists

■ A new line of telescopic hoists designed for 12 to 24-foot dump bodies used on trailers or tandem trucks is announced by the Perfection Steel Body Co., Galion, Ohio. Four models available include single-acting units with either twin 7 or 8-inch cylinders and 80-inch stroke, and single-acting units with 7 or 8-inch cylinders and 54-inch stroke. On trailer applications, twin models are available for power fifth-wheel installation or with hydraulic pump mounted on the tractor. Quick-disconnecting fittings for hose connection to the trailer are provided.

The Perfection line of telescopic hoists features cylinders mounted with pin-eye end connections. This permits a free-swing action of the cylinders to eliminate stress and strain on the hoist when the truck is subjected to unbalanced loading. An equalizer unit that meters oil under pressure equally to each cylinder helps to raise the truck body uniformly.

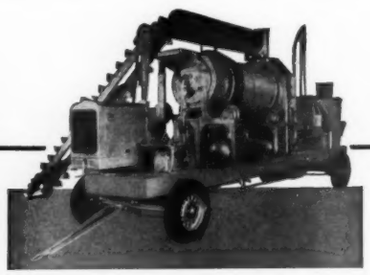
The hydraulic pump features "pressure pocketing", a method of applying pressure to the back of the thrust plates to keep them in sealing contact with the gear ends. This design, it is reported, reduces friction, wear, and oil slippage. The pump is of the spur-gear type with roller bearings and bronze wear plates.

The pump, control valve, and relief valve are combined in a single unit to eliminate the cost of external piping. The manufacturer states that the volumetric efficiency of the hydraulic pump is over 95 per cent, while mechanical efficiency is over 90 per cent.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 320.

Weatherhead Appoints

Gene P. Robers has been named sales manager of the newly created distributor division of The Weatherhead Co., Cleveland, Ohio. In this capacity, Mr. Robers will direct selling activity for Weatherhead's Ermeto fittings, heavy-duty hose, and re-usable couplings sold through industrial distributors.



The new Model 6-18 Meili-Blumberg traffic-lane marker has a special rear-wheel-pivot arrangement for better maneuverability.

Traffic-Lane Marker Has Steering Feature

■ A new center-line traffic-lane marker that handles both reflective and standard paints and incorporates a unique rear steering device has just been announced by the Meili-Blumberg Corp., 757 N. Broadway, New Holstein, Wis. Known as the Model 6-18, it has an 18-gallon capacity and is powered by a 6-hp Wisconsin engine. It lays a solid or intermittent single line, with or without reflective beading, at a rate of 3 to 5 mph. The spray gun can be set for center-line marking or may be mounted on a frame outside of the wheels, permitting close work up to safety islands and curbs.

The pivot arrangement of the rear wheel enables the machine to be steered easily in circles, figure 8's, and straight lines, or to conform to any desired marking job. The operator, riding on the built-in trailer platform, has all controls conveniently within reach and complete visibility for operating and steering.

Additional features include a paint strainer in the circuit, an air-actuated gun, a paddle-type paint agitator, a cleaner tank, a control valve, and an 18-gallon ASME-approved safety tank.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 243.

Bulletin on Motor Grader Lists Varied Attachments

■ A new bulletin featuring the Adams motor grader No. 550 is now available. This 24,000-pound grader is powered by a 100-hp engine.

Front and back covers are devoted to action pictures while the inside pages illustrate and describe the construction and operating features of the machine. The various blade positions are pictured along with detailed views of the unit's constant-mesh transmission, full-floating rear axle, and engine.

Also described is a wide variety of optional equipment that adds to the grader's usefulness such as scarifier, bulldozer, elevating grader, V-type snowplow, and wing, rotary snowplow, etc.

For further information write to the J. D. Adams Mfg. Co., P. O. Box 853, Indianapolis, Ind., or use the Request Card at page 18. Circle No. 244.

Light Aluminum Stages

■ Decking equipment made with lightweight aluminum channel applied over a heavy-duty ladder frame is being offered by the Louisville Ladder Co., 1101 W. Oak St., Louisville 10, Ky. A novel method of securing rungs to the side rails is reported to give the units strength and rigidity. Lengths through 30 feet are available. The light weight of the equipment permits easy handling on steel structural work.

Other items offered by this company include heavy-duty ladders in straight, two-section extension, and three-section extension styles. A special type of step ladder with two ladder rungs side by side is available in sizes through 20 feet. The complete line of industrial ladder products offered includes A-jacks, extension trestles, platform ladders, scaffold planks, marine ladder equipment, and utility ladders.

For further information write to the company, or use the Request Card at page 18. Circle No. 298.

Screw-Anchor Expander

■ A tool for installing lead screw anchors quickly in masonry walls is offered by the Greenlee Tool Co., Rockford, Ill. It sets the anchor securely, regardless of the thickness of the masonry. The hole into which the anchor goes does not have to be drilled to an accurate depth.

In use, the lead screw anchor is screwed onto the expander and inserted into the drilled hole. Striking the head of the expander with a hammer or mallet secures the anchor in the wall. The tool is available in three sizes.

For further information write to the company, or use the Request Card at page 18. Circle No. 292.

The Penndrill Model E diamond core drill is designed to drill through hard concrete.

New Portable Concrete Coring Drill

■ A portable electric drill that uses diamond coring bits for drilling in or extracting test cores from concrete structures has been developed by the Pennsylvania Drilling Co., 1205 Chartiers Ave., Pittsburgh 20, Pa. The drill makes holes from ½ to 6½ inches in diameter through concrete, reinforced concrete, marble, granite, tile, glass, brick, and porcelain. The drill is also adapted for drilling with steel hole saws and twist drills.

The Penndrill Model E includes a lever-operated press for advancing or retracting the bit. It is adapted to diamond core drilling of vertical, horizontal, or angle holes and operates on either 115 or 230-volt ac or dc current. A portable 1,500-watt 115-volt dc electric plant is furnished as optional equipment.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 322.

The Elwell-Parker lift-trucks have Lincoln's Centro-Matic lubrication system.

Central Lubrication on Fork-Lift Trucks

■ A line of lift trucks equipped with centralized lubrication systems is now available from the Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, Ohio. The units use the Lincoln Engineering Co.'s Centro-Matic lubrication system.

The advantage of using the system is the thorough lubrication of the truck in minimum time. Even hard-to-reach points underneath the truck receive the necessary lubrication, it is reported. The company points out that the system reduces maintenance time since one man can do the job in less than 60 seconds. Furthermore, starving or over-lubrication of bearings is prevented.

An injector for each lubrication point is connected to the bearing by a tube and receives its supply of grease under pressure from a central pumping unit. Each injector measures out a prescribed amount of grease each time pumping pressure is applied. The amount of grease sent to the bearing can be varied by an adjustable knob. The system works under a pressure of about 2,500 psi so that grease gets to even the tightest joints. An indicator stem on each injector provides visible evidence that grease is being properly metered.

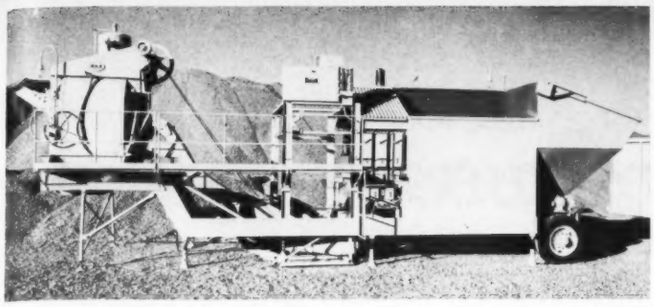
For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 323.

Trucks for Heavy Construction Hauling

■ A new folder from the Autocar Division of the White Motor Co., Ardmore, Pa., tells about the heavy haulers the company builds for the construction industry.

Illustrations show the trucks equipped with a variety of bodies performing many different tasks. The biggest of the company's tractors are pictured hauling trailers loaded with power shovels and earth-moving equipment.

To obtain this literature write to the company, or use the Request Card that is bound in at page 18. Circle No. 324.



The new Auto-Crete portable batching plant has a production rate of 125 to 150 cubic yards of concrete per day.

Mobile Batching Plant May Be Towed to Site

■ A new self-contained portable concrete batching and mixing plant is being produced by the Auto-Crete Co., 612 Security Bldg., P. O. Box 1521, Phoenix, Ariz. The new Auto-Crete plant is reported to be cheaper to operate and requires only a two-man crew instead of the normal five to seven for similar setups. The unit is also said to have a high production rate and to provide uniform accuracy in concrete batching. Production is reported to be 125 to 150 cubic yards of concrete per day.

One of the outstanding features of the plant is mobility. The complete unit is 34½ feet long, 13 feet 4 inches high, and 8 feet wide. All these dimensions are within legal highway limits. The plant can be towed anywhere with a 1½-ton tractor unit.

Three self-contained storage bins hold 12 tons each of sand and gravel and 176 cubic feet of cement. These materials are fed into the skip by electric controls. The sand and gravel are moved on conveyors, and the cement is moved through a screw. The materials are weighed electrically. Power for the unit's operation is provided by a gasoline-engine-driven electric generator.

For further information write to the company, or use the Request Card that is bound in at page 18. Circle No. 287.

Data on Tractor-Shovel With Torque Converter

■ Literature describing its front-end loader equipped with a torque converter is available from Contractors Machinery Co., Inc., Clinton St., Batavia, N. Y. It is pointed out that the Trojan Loadster's torque-converter drive is a true torque multiplier and not just a simple fluid drive. Power is provided by an International 6-cylinder engine.

Like all Trojan Loadsters, the Model LC-100 loads over the drive wheels, the load weight being used to provide greater traction. This unit's reverse-curve bucket arms are a production and safety feature. They provide easy access to the operator's compartment and permit unobstructed vision at all times. The fully hydraulic machine has a 1¼-cubic-yard bucket and lifts up to 5,200 pounds.

A 4-speed transmission affords ample range to suit various operating conditions. Action is transmitted through a twin multiple-disk clutch which is controlled by an independent directional lever located under the steering wheel.

To obtain this literature write to the company, or use the Request Card at page 18. Circle No. 250.

New All-Weather Cab for Excavator-Cranes

■ A roomier all-weather cab for the Gar Wood Series 75 standard and heavy-duty ¾-yard excavators and 20-ton truck cranes has been announced by Gar Wood Industries, Inc., Findlay Division, Findlay, Ohio. The new cab features extruded rubber-mounted windows that are said to give complete protection from the weather. In addition, the rubber mounting makes a more rigid unit and facilitates glass replacement.

The window assembly folds back easily during hot weather operation, eliminating inconvenience and the storage and breakage problems of removable windows. Rear and side panels of the cab can also be opened for complete ventilation. The cab affords easy access to all machinery for conversion, adjustments, and major maintenance, according to the manufacturer. Ample work and head room is provided throughout the machinery deck.

The wide glass area and a large window in the door permit a complete view of the working area. The door, mounted on a roller path, opens and closes easily.

The Gar Wood Series 75 excavator-cranes now have a new cab.

The Gar Wood Series 75 excavators and truck cranes, introduced two years ago, feature direct right-angle drive, a built-in crowd mechanism for easy convertibility, independent travel, power-actuated drum clutches, and the company's Foundation Borer attachment.

For further information write to the company, or use the Request Card at page 18. Circle No. 204.

TRADING POST

CLASSIFIED ADVERTISING

An advertising inch in the Trading Post is measured ⅞-inch vertically on one column. Space reservations close in the New York office on the 10th of the month preceding publication. Send your classified copy to:

The Trading Post, Contractors & Engineers
470 Fourth Avenue, New York 16, N. Y.

INDEX TO ADVERTISERS

(Names in italics are advertising agencies)

Manufacturer Memos

Miller Named President Of American Vitrified

American Vitrified Products Co., Cleveland, Ohio, elected E. L. Miller as president at the annual meeting of the board of directors. He was formerly vice president and general manager.

James G. Robertson, president of the company since 1933, was named chairman of the board. J. L. Brown, formerly vice president in charge of sales, was named vice president and general sales manager.

The new president joined American Vitrified in 1924 and worked in the traffic and sales departments before being appointed vice president and general manager in 1946. He is a director of the National Clay Pipe Association and serves on committees of the American Society of Testing Materials.

New Koehring Executive

Koehring Co., Milwaukee, Wis., has announced the appointment of H. R. Powers as general manager of its west coast subsidiary, Koehring Co. of California. From offices in Stockton, Calif., he will direct the manufacturing operations and the servicing of Koehring equipment for users in western states. Mr. Powers formerly was domestic sales manager of the LeTourneau-Westinghouse Co., Peoria, Ill., and had been connected with that company for nine years.

Soiltest Representative

M. D. Morris of New York, N. Y., has been appointed eastern representative for Soiltest, Inc., Chicago, Ill., manufacturer of test apparatus for soils and concrete. Formerly with the company's sales engineering department, Mr. Morris is an associate member of the American Society of Civil Engineers and a member of the Society of Military Engineers. His offices will be located at 545 Fifth Ave., New York 17, N. Y.

Julien R. Steelman, president of the Power Crane & Shovel Assn.

Steelman Is President Of Power Crane & Shovel

Members of the Power Crane & Shovel Association, a national group composed of 17 leading manufacturers of excavators in this country, have elected Julien R. Steelman president of the organization for 1954. Mr. Steelman, president of the Koehring Co., Milwaukee, Wis., has been a director of the association for the past two years.

Mr. Steelman was elected to head the organization at its annual meeting in Chicago. The Power Crane & Shovel Association was organized to advance the interests of the excavator-manufacturing industry. It informs machinery users of advances made in the field and acts to solve common production and marketing problems in the industry.

Link-Belt Co. Transfers Two District Managers

Assignment of new district managers to the Cleveland, Ohio, and Newark, N. J., offices has been announced by Link-Belt Co., Chicago, Ill. John D. Riley has been named to the Cleveland office, while Harry G. Andersen is the new manager of the Newark branch.

Mr. Riley, who has been district manager at Newark the last five years, joined Link-Belt in 1934. He has served in various departments of the company's Philadelphia plant and was district sales engineer in the Boston office before going to Newark.

The district manager at Birmingham, Ala., for the last three years, Mr. Andersen started with the firm in 1937. He has served in the Chicago and Milwaukee sales offices of Link-Belt.

Gorman-Rupp Appoints

The Gorman-Rupp Co., Mansfield, Ohio, manufacturer of engine and motor-powered pumps, has announced three new appointments. Willis T. Holmes has joined the firm as west coast district manager, with headquarters in Arcadia, Calif. He will coordinate business in the irrigation, petroleum, and construction pump fields in his area.

Newly appointed district representative in the southeast is Gilbert J. Kirwan, with offices in Atlanta, Ga. He has been active in the pump business since 1937. C. F. Campbell, named east-central district representative, has been associated with Gorman-Rupp in sales, advertising, and production assignments since 1946.

Garvin Pelsue, a vice president for The Jaeger Machine Co.

Vice President for Jaeger

Garvin Pelsue has been named vice president in charge of plant operations for The Jaeger Machine Co., Columbus, Ohio, manufacturer of air compressors, pumps, concrete mixers, paving machinery, and tractor loaders. Mr. Pelsue was formerly manager of plant operations for the company.

Hercules Powder Appoints

J. H. Tyler McConnell has been appointed to the newly created post of assistant to the president of Hercules Powder Co., Wilmington, Del. He joined the legal department of the company 13 years ago and has been serving as special assistant to the executive committee since 1951.

During World War II, Mr. McConnell acted as manager and plant counsel on Hercules-operated ordnance plants.

J. Joseph Kelleher has been appointed sales manager of the explosives department. He has been with the department since 1929.

Clark Equipment Personnel

Two new district managers and two new chief engineers have been named for the construction machinery division of Clark Equipment Co., Buchanan, Mich., manufacturer of power shovels, cranes, draglines, and tractor shovels formerly produced by the Michigan Power Shovel Co.

Dudley A. Burnett will represent the division in the south, Atlantic coast, and New England districts. Representing Clark in Texas, Oklahoma, and the 11 western states, is Marshall O. Nystrom. Both men were former district representatives for Frank G. Hough Co.

George Davis and Lowell Conrad have been appointed chief engineers. Mr. Davis is chief engineer of the power shovel line and will be concerned with the design and development of Michigan cranes and shovels. Mr. Conrad's duties will be concentrated on the company's tractor shovel line.

Sales Change at B-E

Donald E. Lutz, former Dallas representative for Bucyrus-Erie Co., South Milwaukee, Wis., manufacturer of excavators, has been made a sales representative in the organization's western sales district. Mr. Lutz, who joined the organization in 1947, will work from the San Francisco office which serves California, Arizona, Nevada, Utah, and part of Wyoming.

Goodyear District Manager

The new district manager in St. Louis, Mo., for Goodyear Tire and Rubber Co.'s industrial products division is Robert J. Burns, formerly a field representative at Chicago. He succeeds C. O. Roome.

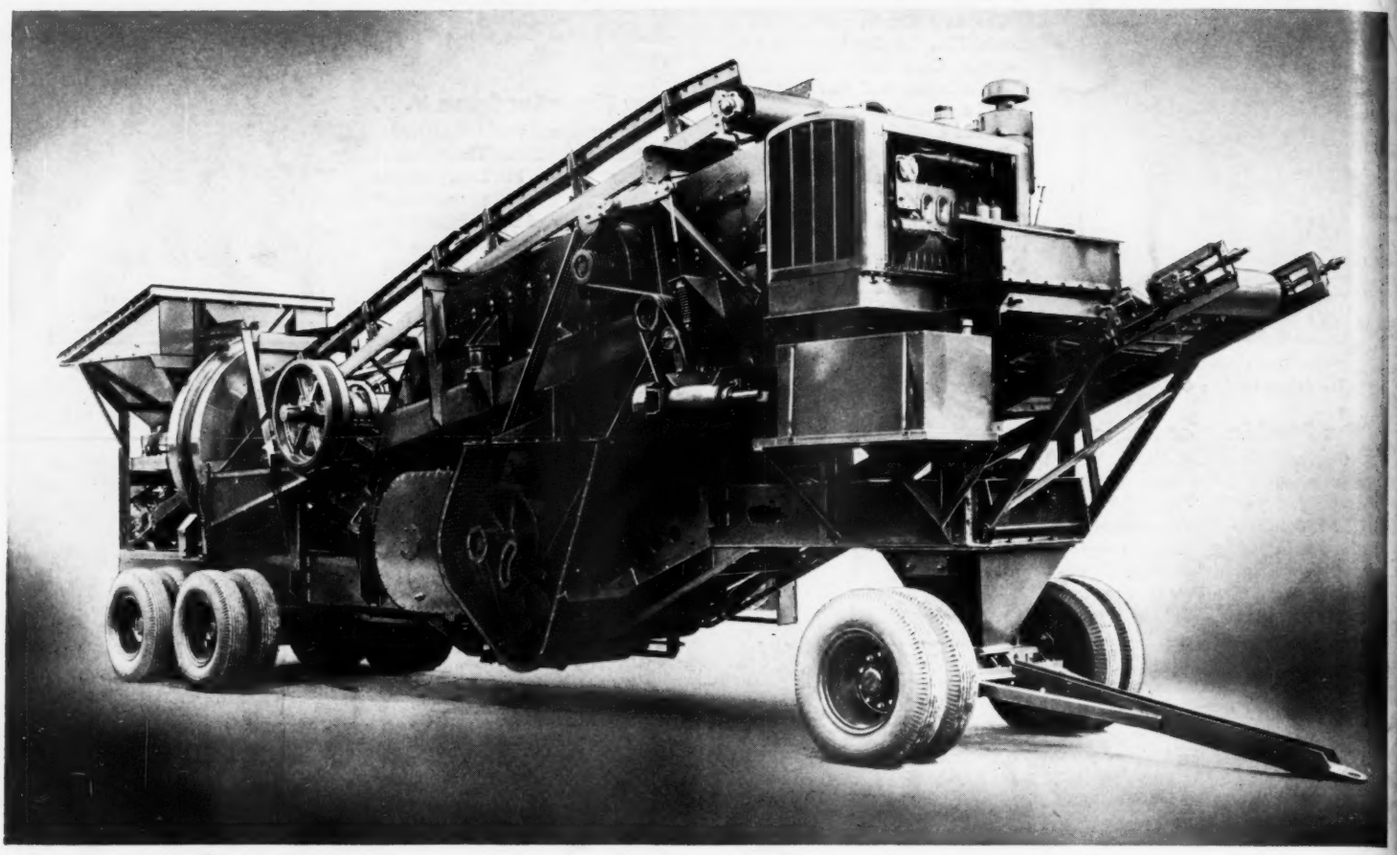
B. E. McClelland, field representative at Madisonville, Ky., will replace Burns at Chicago; K. E. Reed, field representative at Jacksonville, Fla., will take over at Madisonville; P. P. Percich, field representative at Chattanooga, Tenn., will go to the Jacksonville post; H. V. Atkinson, on the industrial products desk at Atlanta, Ga., will replace Percich at Chattanooga.

Burns joined the Goodyear organization in 1947.

Thew Elects Lundgren V. P.

A. C. Lundgren has been elected a vice president of the Thew Shovel Co., Lorain, Ohio. Mr. Lundgren has been with Thew for 43 years and has been a director of the company and director of purchases since 1946. He will retain the responsibility for procurement of materials.

A. C. Lundgren, a vice president of The Thew Shovel Co.



Why this new ultra-modern in-line plant was developed

● Here it is . . . a gravel plant with a 1036 jaw crusher, 30″ x 24″ rolls, and a big 4′x12′—2½ deck vibrating screen,—*yet which weighs only 55,900 lbs. on the road* . . . a plant equipped with the most efficient mechanical drives ever devised for a portable plant . . . a plant which can be moved without dismantling!

In the past, highway load limits have been met in one of two ways . . . either by reducing the size of crushers, screens, and other units in order to save weight . . . or by dividing the plant into individually mounted primary and secondary plants.

In one case, capacity was sacrificed. In the other, portability was lost, cost was higher, and longer setup time was needed at the pit.

Specially designed crushers, screens

To create the new 35-S, PIONEER engineers began by redesigning its basic units. They developed a new angle of tilt for the jaw crusher to improve feeding of oversize and make adjustment easier. The 1036 crusher, incidentally, is the largest used in any portable duplex gravel plant.

The specially designed 30″ x 24″ roll crusher is hydraulically adjusted and gives ⅓ *more crushing area.* A new-type 4′x12′—2½ deck vibrating screen and 30″ conveyors, are as large as you'll find on any plant of comparable weight and cost.

Efficient drive is developed

V-belts and a minimum of high-speed steel roller chains drive the entire plant, except for one fully enclosed right-angle drive.

For quick moves, it's seldom necessary to dismantle feeder hopper, feeder, sand conveyor, or power unit. Just pull into a new pit, start the power, and go to work!

The 35-S is designed for long life with a minimum of down-time. On the rare occasions when maintenance is necessary, parts are easy-to-reach and easy-to-repair.

If you're considering a project in which extra portability and low cost production will prove an advantage, it will pay you to investigate this revolutionary new plant. You'll be surprised at its low cost, as well as the competitive advantages it will give you. For more details, write to Pioneer Engineering Works, Inc., Minneapolis 13, Minnesota (subsidiary of Poor & Company, Chicago).

MOVING WEIGHT AND POWER	
Total weight	55,900 lbs.*
Weight front end	22,800 lbs.*
Weight rear end	31,100 lbs.
Power required	130-150 HP continuous at 900 RPM output shaft speed for on-plant, 900-1200 RPM output shaft speed for off-plant.

*Weight with semi-hitch. For single axle dolly, add 2200 lbs.

BUY BOTH! HIGHER OUTPUT LOWER UPKEEP

Pioneer *Continuflo* EQUIPMENT

Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn.
Please send information on equipment checked.

- ☐ GRAVEL PLANTS
- ☐ WASHING PLANTS
- ☐ MECHANICAL FEEDERS
- ☐ ROCK PLANTS
- ☐ BITUMINOUS PLANTS
- ☐ VIBRATING SCREENS
- ☐ JAW CRUSHERS
- ☐ APRON FEEDERS
- ☐ BUZZER SCREENS (LIGHT DUTY)
- ☐ ROLL CRUSHERS
- ☐ ORO FEEDERS
- ☐ CONTINUFLO CONVEYORS

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

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